Water Quality Improvement Plan

HARDWARE & NORTH FORK HARDWARE RIVER

A plan to reduce bacteria in the water

Technical Document

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Prepared by
VA Department of Environmental Quality

In Cooperation with
Local Stakeholders
Virginia Tech Biological Systems Engineering

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Local landowners and stakeholders

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Fluvanna County Farm Bureau

Thomas Jefferson Soil and Water Conservation District

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Friends of the Hardware River

VA Department of Health

Fluvanna County Farm Bureau

Walton Middle School

North Garden Fire Hall

The Town of Scottsville

1. INTRODUCTION

1.1 Background

The Clean Water Act (CWA) that became law in 1972 requires that all U.S. streams, rivers, and lakes meet their state's water quality standards. The CWA also requires that states conduct monitoring to identify polluted waters or those that do not meet standards. Through this required program, the state of Virginia has found that many streams do not meet state water quality standards for protection of the five beneficial uses: fishing, swimming, shellfish, aquatic life, and drinking.

When streams fail to meet standards, Section 303(d) of the CWA and the U.S. Environmental Protection Agency's (EPA) Water Quality Management and Planning Regulation both require that states develop a Total Maximum Daily Load (TMDL) for each pollutant. A TMDL is a "pollution budget" for a stream. That is, it sets limits on the amount of pollution that a stream can tolerate and still maintain water quality standards. In order to develop a TMDL, background concentrations, point source loadings, and non-point source loadings are considered. A TMDL accounts for seasonal variations and must include a margin of safety. Through the TMDL process, states establish water-quality based controls to reduce pollution and meet water quality standards.

Once a TMDL is developed, measures must be taken to reduce pollution levels in the stream. Virginia's 1997 Water Quality Monitoring, Information and Restoration Act (WQMIRA) states that the "Board shall develop and implement a plan to achieve fully supporting status for impaired waters". A TMDL Implementation Plan describes control measures, which can include the use of better treatment technology and the installation of best management practices (BMPs), to be implemented in order to meet the water quality goals established by the TMDL.

1.2 Designated Uses and Applicable Water Quality Standards

Water quality standards are designed to protect the public health or welfare, enhance the quality of water and serve the purposes of the State Water Control Law (§62.1-44.2 et

seq. of the Code of Virginia) and the federal Clean Water Act (33 USC §1251 et seq.)." Virginia Water Quality Standard 9 VAC 25-260-10 (Designation of uses.) states:

All state waters, including wetlands, are designated for the following uses: recreational uses, e.g., swimming and boating; the propagation and growth of a balanced, indigenous population of aquatic life, including game fish, which might reasonably be expected to inhabit them; wildlife; and the production of edible and marketable natural resources, e.g., fish and shellfish.

1.2.1 Bacteria Water Quality Criterion (9 VAC 25-260-170)

In order to protect human health during primary contact recreation (e.g., swimming), the Commonwealth of Virginia has set limits on the amount of specific fecal bacteria in all state waters. The bacteria criterion for freshwater in place when the Hardware River and its North Fork were initially listed as impaired was based on fecal coliform. For a non-shellfish supporting water body to be in compliance with Virginia fecal coliform standard for contact recreational use, VADEQ specified the following criteria (Virginia Water Quality Standard 9 VAC 25-260-170):

A. General requirements. In all surface waters, except shellfish waters and certain waters addressed in subsection B of this section, the fecal coliform bacteria shall not exceed a geometric mean of 200 fecal coliform bacteria per 100 ml of water for two or more samples over a 30-day period, or a fecal coliform bacteria level of 1,000 per 100 ml at any time.

If the waterbody exceeded either criterion more than 10% of the time, the waterbody was classified as impaired and a TMDL was developed and implemented to bring the waterbody into compliance with the water quality criterion. Based on the sampling frequency, only one criterion was applied to a particular datum or data set (Virginia Water Quality Standard 9 VAC 25-260-170). If the sampling frequency was one sample or less per 30 days, the instantaneous criterion was applied; for a higher sampling frequency, the geometric criterion was applied. The instantaneous fecal coliform water quality standard was modified in 2003 to a level of 400 colony forming units (cfu) per 100 ml.

Sufficient fecal coliform bacteria standard violations were recorded at VADEQ water quality monitoring stations to indicate that the recreational use designations were not

being supported the Hardware and North Fork Hardware Rivers (VADEQ, 2006). Most of the VADEQ's ambient water quality monitoring is done on a monthly or quarterly basis. This sampling frequency does not provide the two or more samples within 30 days needed for use of the geometric mean part of the standard. Therefore, VADEQ used the 400 cfu/100 mL standard in the 2004 Section 303(d) assessment for the fecal coliform bacteria monitoring data.

Studies have shown that there is a stronger correlation between the concentration of *E. coli* and the incidence of gastrointestinal illness than there is with fecal coliform (USEPA, 1986), so the state transitioned from a fecal coliform standard to an *E. coli* standard in beginning in 2003. All freshwaters were subject to the *E. coli* standard described below, and until June 30, 2008, the interim fecal coliform standard described below also applied to any sampling stations with fewer than 12 *E. coli* samples (State Water Control Board, 2006):

Interim Fecal Coliform Criterion: *Fecal coliform bacteria shall not exceed a geometric mean of 200 fecal coliform bacteria per 100 mL of water for two or more samples over a calendar month nor shall more than 10% of the total samples taken during any calendar month exceed 400 fecal coliform bacteria per 100 mL of water. This criterion shall not apply for a sampling station after the bacterial indicators described in subdivision 2 of this subsection [E. coli criterion] have a minimum of 12 data points or after June 30, 2008, whichever comes first.*

***Escherichia coli* Criterion**: *E. coli bacteria concentrations for freshwater shall not exceed a geometric mean of 126 counts per 100 mL for two or more samples taken during any calendar month and shall not exceed an instantaneous single sample maximum of 235 cfu/100mL.*

As a part of VADEQ's triennial review of water quality standards, revisions to the applicable bacteria standard were proposed in March 2008. The proposed revisions removed the interim fecal coliform criterion and revised the *E. coli* criterion to remove the instantaneous single sample maximum of 235 cfu/100ml. The revised criterion consists of only the *E. coli* geometric mean criterion of 126 cfu/100ml.

Since the *E.coli* criterion became effective on January 15, 2003, it was considered the applicable water quality standard for the development of the Hardware River and North Fork Hardware River bacteria TMDL (herein referred to as the Hardware River TMDL). In addition to meeting the geometric mean criterion, the TMDL was also developed to

meet the *E. coli* instantaneous target concentration of 235 cfu/100ml with a violation rate of less than 10.5%. Meeting this target provided consistency with VADEQ assessment guidance (VADEQ, 2007).

1.3 Attainability of Designated Uses

All waters in the Commonwealth have been designated as "primary contact" for the swimming use regardless of size, depth, location, water quality or actual use. The bacteria standard described in Section 1.2 of this report is to be met during all stream flow levels and was established to protect bathers from ingestion of potentially harmful bacteria. However, many headwater streams are small and shallow during base flow conditions when surface runoff has minimal influence on stream flow. Even in pools, these shallow streams do not allow full body immersion during periods of base flow. In larger streams, lack of public access often precludes the swimming use.

Recognizing that all waters in the Commonwealth are not used extensively for swimming, Virginia has approved a process for re-designation of the swimming use for secondary contact in cases of: 1) natural contamination by wildlife, 2) small stream size, and 3) lack of accessibility to children, as well as due to widespread socio-economic impacts resulting from the cost of improving a stream to a “swimmable” status.

The re-designation of the current swimming use in a stream will require the completion of a Use Attainability Analysis (UAA). A UAA is a structured scientific assessment of the factors affecting the attainment of the use, which may include physical, chemical, biological, and economic factors as described in the Federal Regulations. The stakeholders in the watershed, Virginia, and EPA will have an opportunity to comment on these special studies.

In some streams for which TMDLs have been developed, water quality modeling indicates that even after removal of all of the sources of *E. coli* (other than wildlife), the stream will not attain standards. In such a case, after demonstrating that the source of *E. coli* contamination is natural and uncontrollable by effluent limitations and BMPs, the state may decide to re-designate the stream’s use for secondary contact recreation or to

adopt site specific criteria based on natural background levels of *E. coli*. All site-specific criteria or designated use changes must be adopted as amendments to the water quality standards regulations. Watershed stakeholders and EPA will be able to provide comment during this process.

2. REQUIREMENTS FOR IMPLEMENTATION PLANS

There are a number of state and federal requirements and recommendations for TMDL IPs. The goal of this chapter is to clearly define what they are and explicitly state if the "elements" are a required component of an approvable IP or are merely a recommended topic that should be covered in a thorough IP. This chapter has three sections that discuss a) the requirements outlined by the WQMIRA that must be met in order to produce an IP that is approvable by the Commonwealth, b) the EPA recommended elements of IPs, and c) the required components of an IP in accordance with Section 319 guidance.

2.1 State Requirements

The TMDL IP is a requirement of Virginia's 1997 Water Quality Monitoring, Information, and Restoration Act (§62.1-44.19:4 through 19:8 of the Code of Virginia), or WQMIRA. WQMIRA directs the SWCB to "develop and implement a plan to achieve fully supporting status for impaired waters." In order for IPs to be approved by the Commonwealth, they must meet the requirements as outlined by WQMIRA. WQMIRA requires that IPs include the following (VADEQ and VADCR, 2003):

- date of expected achievement of water quality objectives,
- measurable goals,
- necessary corrective actions, and
- associated costs, benefits, and environmental impact of addressing the impairment.

2.2 Federal Recommendations

Section 303(d) of the CWA and current EPA regulations do not require the development of implementation strategies. The EPA does, however, outline the minimum elements of an approvable IP in its 1999 *Guidance for Water Quality-Based Decisions: The TMDL* Process (USEPA, 1999). The listed elements include:

- a description of the implementation actions and management measures,
- a time line for implementing these measures,
- legal or regulatory controls,
- the time required to attain water quality standards, and
- a monitoring plan and milestones for attaining water quality standards.

It is strongly suggested that the EPA recommendations be addressed in the IP, in addition to the required components as described by WQMIRA.

2.3 Requirements for Section 319 Fund Eligibility

The EPA develops guidelines that describe the process and criteria used to award CWA Section 319 nonpoint source grants to States. The guidance is subject to revision and the most recent version should be considered for IP development. The "Supplemental Guidelines for the Award of Section 319 Nonpoint Source Grants to States and Territories in FY 2003" identifies the following nine elements that must be included in the IP to meet the 319 requirements:

1. Identify the causes and sources or groups of similar sources that will need to be controlled to achieve the load reductions estimated in the watershed-based plan;
2. Estimate the load reductions expected to achieve water quality standards;
3. Describe the NPS management measures that will need to be implemented to achieve the identified load reductions;
4. Estimate the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement the watershed-based plan.
5. Provide an information/education component that will be used to enhance public understanding of the project and encourage the public's participation in selecting, designing, and implementing NPS management measures;
6. Provide a schedule for implementing the NPS management measures identified in the watershed-based plan;
7. Describe interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented;
8. Identify a set of criteria for determining if loading reductions are being achieved and if progress is being made towards attaining water quality standards; if not, identify the criteria for determining if the watershed-based plan needs to be revised; and
9. Establish a monitoring component to evaluate the effectiveness of the implementation effort.

3. REVIEW OF TMDL DEVELOPMENT

3.1 Background

The Hardware River and the North Fork Hardware River (VAV-H19R-01) were first listed as impaired on Virginia's 2002 and 2006 Section 303(d) Total Maximum Daily Load Priority List and Report, respectively, due to water quality violations of the *E. coli* standard (VADEQ 2002, 2006). The Virginia Department of Environmental Quality (VADEQ) has described the impaired segments as presented in **Error! Reference source not found.** and **Error! Reference source not found.**.

Table 3.1 Impaired stream segments addressed in the Hardware River TMDL implementation plan

Impaired Segment	Size	Initial Listing Year	Description
Hardware River	23.03 miles	2002	Extending from the confluence with the North Fork Hardware River to the confluence with the James River
North Fork Hardware River	10.42 miles	2006	Extending from the headwaters to the South Fork Hardware River confluence

The Hardware River and its tributaries are located primarily in Albemarle and Fluvanna Counties, and are part of the James River Basin. The Hardware River watershed totals approximately 88,089 acres (137 mi^2), with forest and pasture as the predominant land uses (Table 3.2, Figures 3.2). According to the 2012 Census of Agriculture, the average farm in Albemarle County is 179 acres, while in Fluvanna County it is 155 acres. Nearly 60% of farm operators in both counties identified their primary occupation as something other than farming. The average net cash income for a farm in Albemarle County was estimated at -$11,043, and in Fluvanna County is was -$3,214 (USDA, 2012). With the avearge age of a farmer in the two counties between 60-62, this information suggests that it is challenging to make a living farming in the region, and that there are a large number of "retirement" or "hobby" farms in the region.

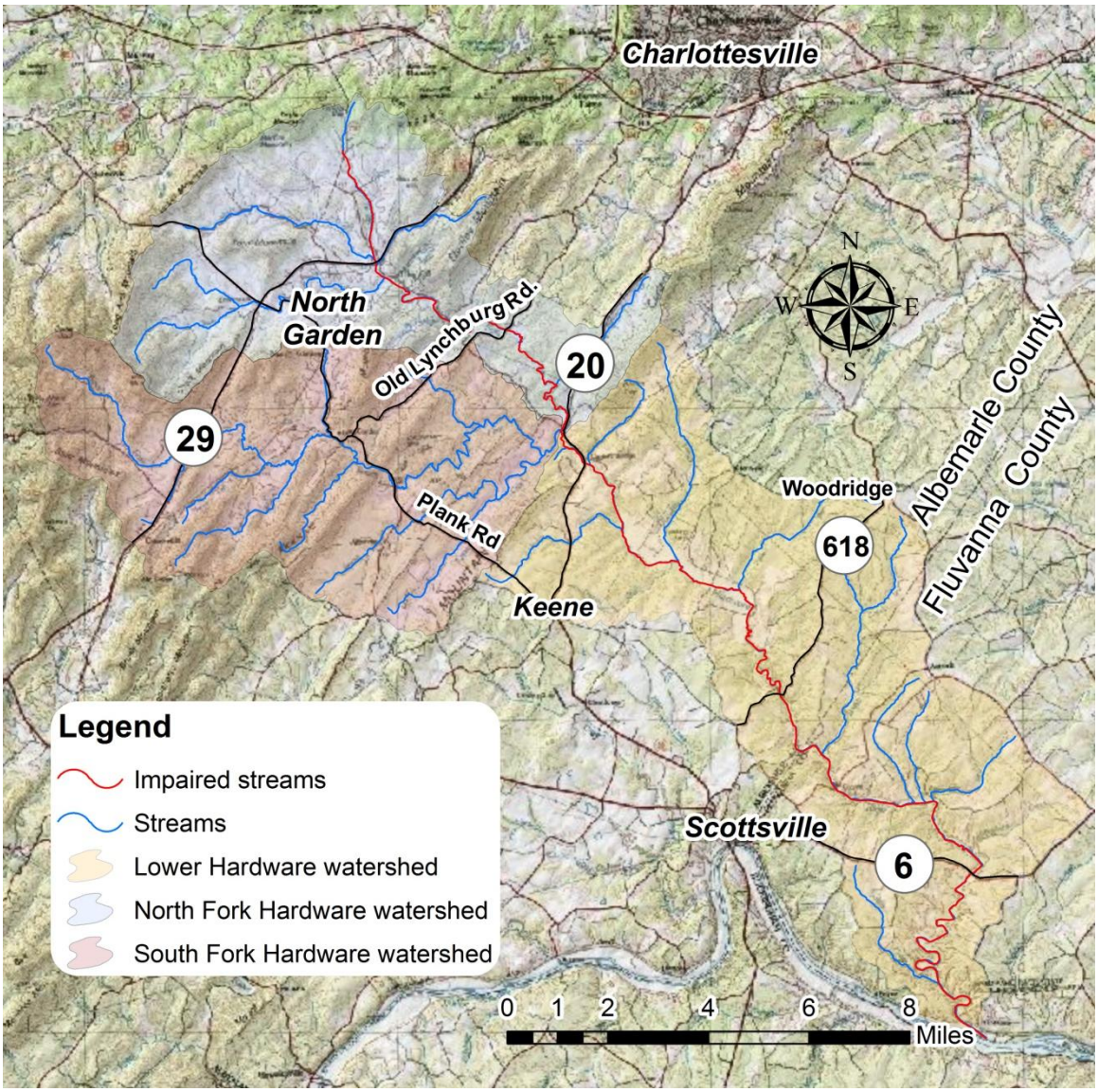

Figure 3.1 Location of the Hardware River watershed and impaired stream segments.

Table 3.1 Land use acreages in the Hardware River and North Fork Hardware River watersheds. Table also shows percent total watershed acreage for each land use category.

Land use	Watershed: Acres (% total acreage)		TOTAL
	Hardware River	*NF Hardware River*	
Cropland	1,012 (1.5%)	21 (0.1%)	1,033 (1.2%)
Forest	50,383 (76.8%)	15,578 (69.4%)	65,961 (74.9%)
High Density Residential	63 (0.10%)	137 (0.6%)	200 (0.2%)
Low Density Residential	1,481 (2.3%)	862 (3.8%)	2,343 (2.7%)
Pasture	12,693 (19.3%)	5,859 (26.1%)	18,552 (21.1%)
TOTAL	**65,632**	**22,457**	**88,089**

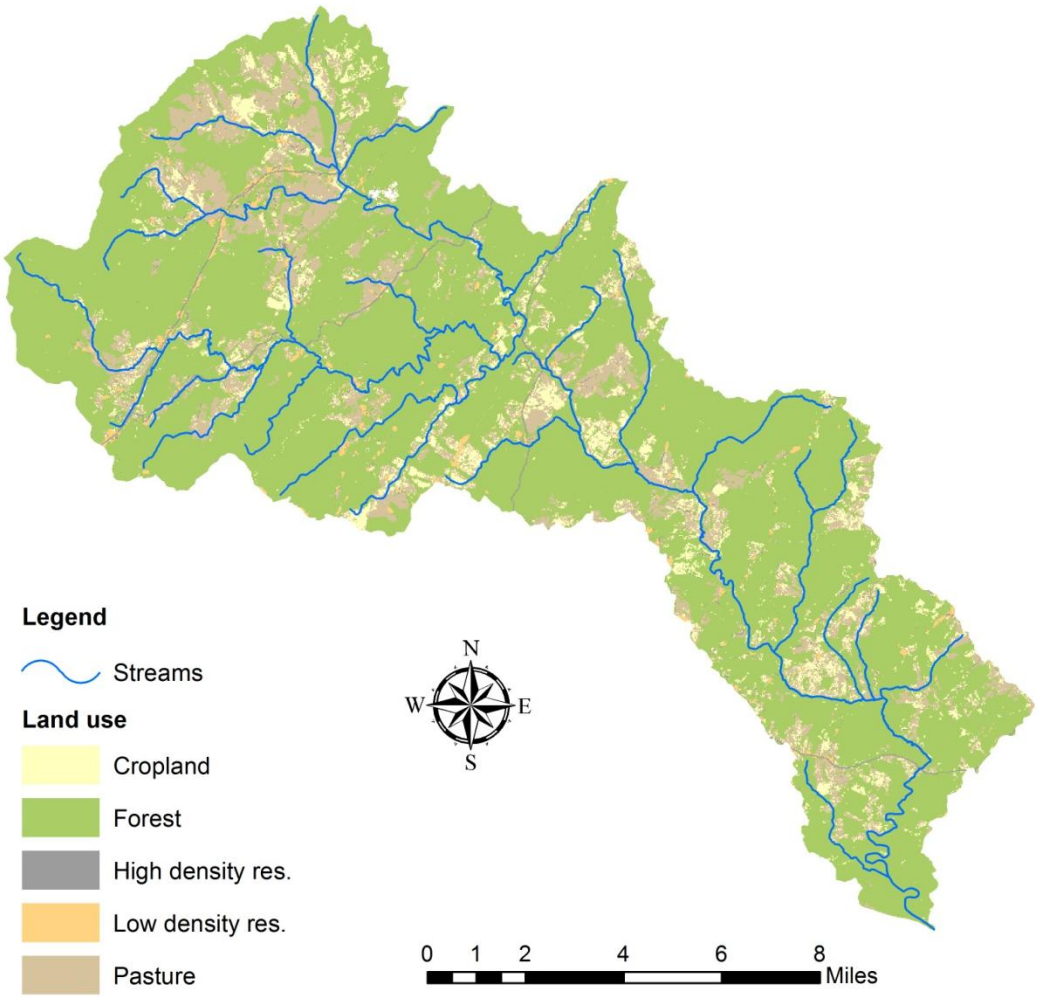

Figure 3.2 Land uses in the Hardware River watershed.

Virginia Tech's Department of Biological Systems Engineering was contracted by the Virginia Department of Environmental Quality (VADEQ) to develop the TMDL for the Hardware River and its tributaries in 2006 and the TMDL study was completed in July 2007 (VADEQ, 2007). During development of the Hardware River TMDL implementation plan, a series of errors were discovered in the modeling work completed in support of the TMDL. Revisions to the TMDL document included appropriate routing of stream reaches, revision of population estimates and associated bacteria loads, adjustments to water quality calibrations, and adjustments to the overall TMDL load. Revision of the TMDL was completed in 2015 (DEQ, 2015). The TMDL study is posted at www.deq.virginia.gov.

3.2 Water Quality Monitoring Data

Data collected from two of the water quality monitoring stations DEQ has on the Hardware River and its tributaries were used to place the water bodies on the impaired waters list, and to develop the associated bacteria TMDLs. Table 3.2 provides a summary of the data collected from these stations. Table 3.3 shows *E. coli* data collected from all stations in the watershed excluding two sites at which only one sample has been collected. Figure 3.3 shows the locations of the stations.

Table. 3.2 DEQ water quality monitoring stations used for listing and TMDL development for the Hardware and NF Hardware Rivers.

Station ID	Stream Name	Indicator Organism Measured	Number of Samples	Violation Rate (Single Sample Max)	Period of Record
2-HNF008.28	NF Hardware	Fecal coliform	28	28%	1995 - 2006
2-HRD011.57	Hardware	Fecal coliform	145	21%	1979 - 2007

Table. 3.3 Violation rates of the single sample maximum criteria for *E. coli* from DEQ ambient water quality monitoring stations Hardware and NF Hardware Rivers.

Station ID	Stream Name	Indicator Organism Measured	Number of Samples	Violation Rate (Single Sample Max)	Period of Record
2-HNF008.28	NF Hardware	*E. coli*	18	50%	2005 - 2006
2-HRD011.57	Hardware	*E. coli*	78	24%	2003 - 2014
2-HRD000.36	Hardware	*E. coli*	53	9%	2003 - 2010
2-HAK001.34	SF Hardware	*E. coli*	21	10%	2005 - 2012
2-HAK010.23	SF Hardware	*E. coli*	9	11%	2005-2006
2-HNF000.10	NF Hardware	*E. coli*	12	25%	2005 – 2012
2-HNF005.03	NF Hardware	*E. coli*	12	17%	2005 - 2012
2-HNS002.40	South Branch, NF Hardware	*E. coli*	9	56%	2005 - 2006

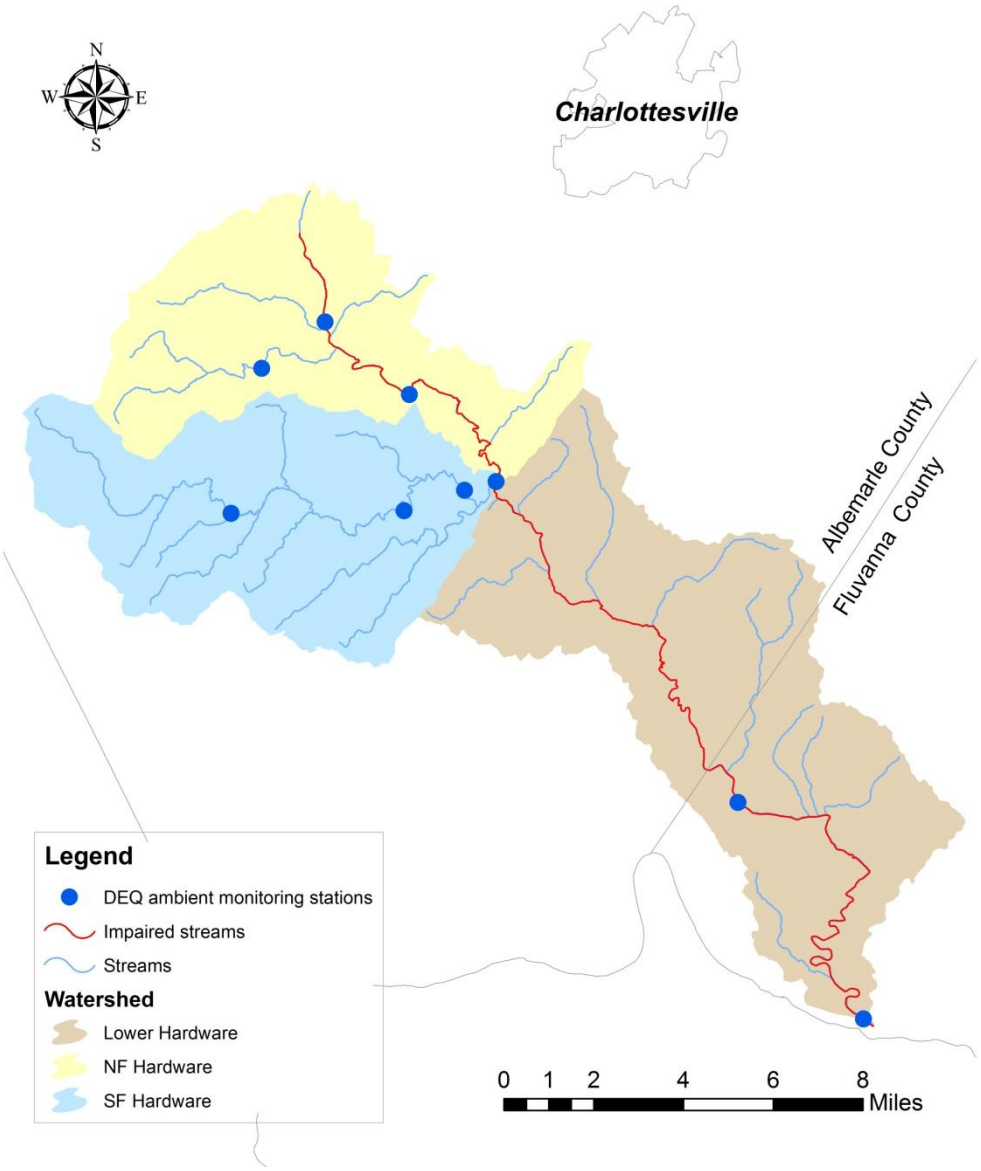

Figure 3.3 VADEQ monitoring stations in the Hardware River, South Fork Hardware River and North Fork Hardware River.

3.3 Water Quality Modeling

The Hydrologic Simulation Program – FORTRAN (HSPF) version 12 (Bicknell et al., 2005; Duda et al., 2001) was used to model fecal coliform transport and fate in the Hardware River watershed. ArcGIS 10 GIS software was used to display and analyze landscape information for the development of input for HSPF. The HSPF watershed model simulates pollutant accumulation, die-off, and wash off according to the distribution of land uses, soils, and geographic features in a watershed. HSPF then simulates the routing of water and pollutants through the stream channel network,

considering instream processes such as die-off. In the Hardware River bacteria TMDL, a source assessment of fecal coliform bacteria was performed for the watershed. Fecal coliform was then simulated as a dissolved pollutant using the HSPF model, and concentrations were translated to *E. coli* concentrations using VADEQ's translator equation (VADEQ, 2003).

To clearly identify sources of fecal coliform, each watershed was divided up into smaller subwatersheds (Figure 3.4). The sources and their respective fecal coliform contributions were identified for each smaller subwatershed based on land use and climate data, and human, livestock and wildlife populations. The HSPF model was then used to simulate the transport of these pollutant loads to the Hardware River and its tributaries.

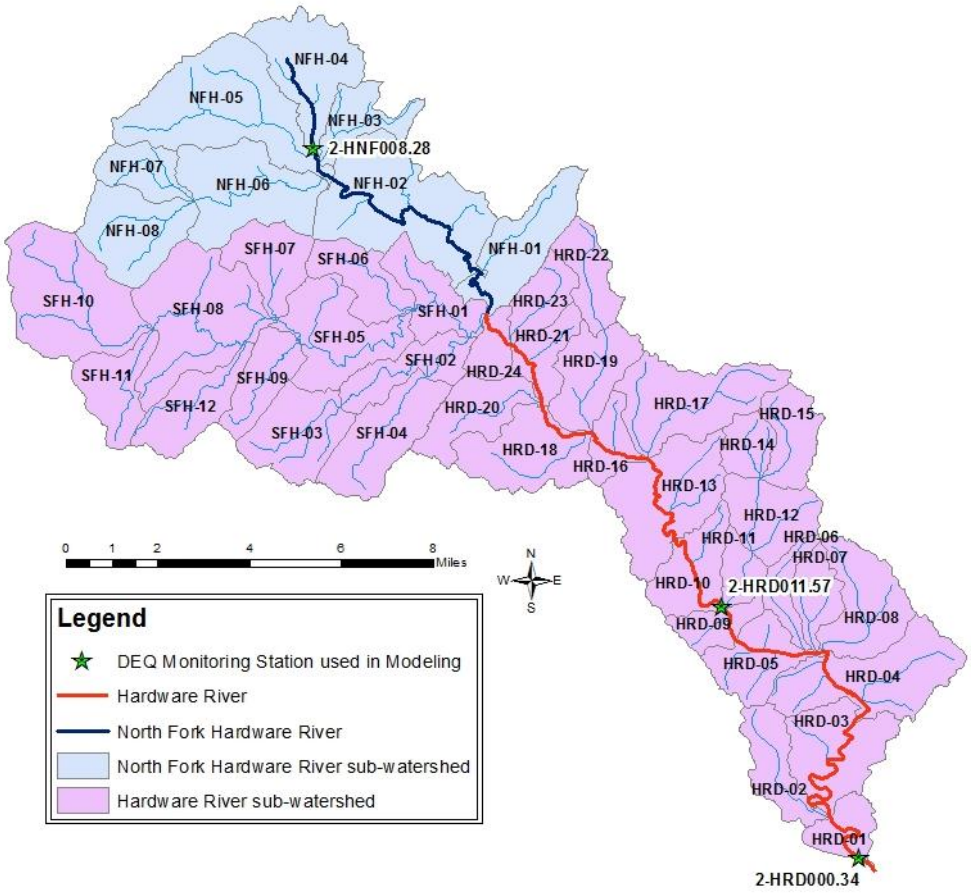

Figure 3.4 Sub-watersheds for North Fork and Hardware River watersheds (NFH: sub-watershed in the North Fork Hardware River, SFH: sub-watershed in the South Fork Hardware River, HRD: sub-watershed in the mainstem Hardware River).

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3.4 Bacteria Source Assessment

Potential sources of bacteria considered in the development of the TMDLs included both point source and nonpoint source contributions.

3.4.1 Point Sources

A TMDL's waste load allocation accounts for the portion of a receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution. Point sources of bacteria in the watersheds include all municipal and industrial plants that treat human waste, as well as private residences that fall under general permits. These point sources are required to maintain an *E. coli* discharge concentration no greater than 200 cfu/100mL. Virginia issues Virginia Pollutant Discharge Elimination System permits for point sources. The point sources of bacteria in the watersheds are listed in Table 3.4, along with their permitted discharges and load allocations in the TMDLs. The waste load allocation for each point source was set at the permitted load.

Table 3.4 Permitted bacteria point sources in the Hardware River watershed.

Permit Number	Facility Name	Sub-watershed	Design Flow (mgd*)	Permitted *E. coli* Conc. (cfu/100 mL)	*E. coli* Load (cfu/year)
VA0083291	Crossroads Village [illegible]	NFH-06	0.02	126	3.48×10^{10}
VAG408054	North Garden Post Office SFH‡	NFH-06	0.001	126	1.74×10^{9}
VAG408412	SFH‡	SFH-08	0.001	126	1.74×10^{9}

*million gallons per day
‡SFH = Single Family Home

3.4.2 Nonpoint sources

Nonpoint source pollution originates from sources across the landscape (e.g., agriculture and urban land uses) and is delivered to waterbodies by rainfall and snowmelt. In some cases, a precipitation event is not required to deliver nonpoint source pollution to a stream (e.g., pollution from leaking sewer lines or livestock directly defecating in a stream). Nonpoint sources of bacteria in the watersheds included residential sewage treatment systems, land application of waste, livestock, wildlife, and domestic pets. Bacteria loads were represented either as land-based loads (where they were deposited on

land and available for wash off during a rainfall event) or as direct loads (where they were directly deposited into the stream). Land-based nonpoint sources are represented as an accumulation of bacteria on the land, where some portion is available for transport in runoff. The amount of accumulation and availability for transport vary with land use type and season. The maximum accumulation was adjusted seasonally to account for changes in die-off rates, which are dependent on temperature and moisture conditions. Direct loads such as straight pipes are modeled similarly to point sources since they do not require a runoff event for delivery to the stream. Both point and non point sources of bacteria in the Hardware River are summarized in Table 3.5.

Table 3.5 Annual fecal coliform loadings to the stream by land use for Hardware River and North Fork Hardware River watersheds.

Source		Annual Fecal Coliform Load (x 10^{12})		Percentage of Annual Load	
		Hardware	NF Hardware	Hardware	NF Hardware
Land based sources	Cropland	18	4	< 1%	< 1%
	Pasture	18,212	3,170	95%	93%
	Residential	656	182	3%	5%
	Forest	135	18	1%	1%
Direct sources	Permitted point sources	<1	<1	< 1%	< 1%
	Straight pipes	16	4	< 1%	< 1%
	Cattle in stream	83	18	< 1%	< 1%
	Wildlife in stream	28	3	< 1%	< 1%
TOTALS		**19,148**	**3,400**	**100%**	**100%**

3.5 TMDL Allocation Scenarios

3.5.1 Bacteria Allocation Scenario and TMDL Expression

The TMDL includes reduction scenarios needed to meet the *E. coli* water quality standard. In order to develop the TMDLs for *E. coli*, fecal coliform bacteria data collected in prior years from the streams needed to be converted to *E. coli* concentrations. VADEQ has developed a procedure to be followed in this situation. The needed modeling was conducted using fecal coliform loadings as the bacteria source in the watershed. Then an equation developed by VADEQ was used to convert the daily average fecal coliform concentrations output by the model to daily average *E. coli* concentrations. The equation is:

$$\textit{E. coli}\ \text{concentration} = 2^{-0.0172} \times (\text{FC concentration})^{0.91905}$$

where the bacteria concentrations (*E. coli* and FC) are in cfu/100 mL. After applying the equation to the output from the LSPC model, daily *E. coli* loads were determined by multiplying the daily concentrations by the average daily flow. The average annual load was determined by summing the daily loads and dividing by the number of years in the allocation period.

Different scenarios were evaluated to identify scenarios for implementation that meet the calendar-month geometric mean bacteria standard (126 cfu/100 mL for *E. coli*) with zero violations and a single-sample maximum concentration of less than 235 cfu/100 mL *E. coli*. The MOS (margin of safety) was implicitly incorporated into each TMDL by conservatively estimating several factors affecting bacteria loadings, such as animal numbers, production rates, and contributions to streams. A preferred scenario was selected by a technical advisory committee for each watershed during the TMDL development process (Table 3.6). An interim scenario was developed during implementation planning to demonstrate the reductions needed in order to remove the rivers from the impaired waters list (Table 3.7). This may occur when the single sample maximum criteria is exceeded less than 10.5% of the time. While the geometric mean standard serves as Virginia's water quality standard for *E. coli*, the single sample maximum criteria was used to develop this interim scenario based on the frequency at

which the waterbodies will be monitored during implementation. The geometric mean standard requires collection of two or more samples in a calendar month; however, sampling is routinely performed by DEQ on a monthly or bi-monthly basis. The TMDLs for the Hardware River and the North Fork Hardware River were derived from the preferred reduction scenarios identified in the TMDL (Table 3.8). An implicit margin of safety is included in the TMDL equations.

Table 3.6 Fecal coliform reduction scenarios needed to meet the *E. coli* geometric mean standards and single sample maximum criteria (0% violation rate).

Watershed	Fecal Coliform Loading Reductions (%)					
	Livestock direct deposit	Pasture	Cropland	Straight pipes & failing septic	Residential	Wildlife direct deposit
NF Hardware	100%	99%	10%	100%	71%	20%
Hardware	100%	99%	10%	100%	83%	0%

Table 3.7 Fecal coliform reduction scenarios needed to remove the Hardware River and North Fork Hardware River from Virginia's 303(d) list of impaired waterbodies.

Watershed	Fecal Coliform Loading Reductions (%)					% Violation of Single sample maximum criteria
	Livestock direct deposit	Pasture	Cropland	Straight pipes & failing septic systems	Residential	
NF Hardware	95%	50%	25%	100%	1%	4.6%
Hardware	99%	64%	70%	100%	1%	10.5%

Table 3.7 TMDL equations for the Hardware River and North Fork Hardware River expressed as an average annual and an average daily load at the watershed outlets.

Watershed	Wasteload Allocation (WLA)		Load Allocation (LA)		Margin of Safety (MOS)	TMDL	
	Annual (cfu/yr)	Daily (cfu/day)[1]	Annual (cfu/yr)	Daily (cfu/day)		Annual (cfu/yr)	Daily (cfu/day)[2]
NF Hardware	0.06E+12	1.64E+8	2.25E+12	1.23E+12	Implicit	2.31E+12	1.23E+12
Hardware	0.02E+13	5.48E+8	2.38E+13	4.81E+12	Implicit	2.40E+13	4.81E+12

3.6 Implications of the TMDLs on the Implementation Plan

Based on the bacteria reductions developed for the TMDL, it is clear that significant reductions will be needed to meet the water quality standard for bacteria, particularly with respect to direct deposition from livestock. In addition, all uncontrolled discharges, failing septic systems, leaking sewer lines and overflows must be identified and corrected.

However, there are subtler implications as well. Implicit in the requirement for 100% correction of uncontrolled discharges is the need to maintain all functional septic systems. Wildlife direct deposition will not be explicitly addressed by this implementation plan. All efforts will be directed at controlling anthropogenic sources.

4. PUBLIC PARTICIPATION

Collecting input from the public on conservation and outreach strategies to include in the TMDL Implementation Plan was a critical step in this planning process. Since the plan will be implemented by watershed stakeholders on a voluntary basis, local input and support are the primary factors that will determine the success of this plan.

4.1 Public Meetings

Two public meetings were held on the evenings of March 31 and April 9, 2015 at Victory Hall in Scottsville and the North Garden Fire Hall, respectively, to kick off development of the plan. These meetings served as opportunities for local residents to learn more about the problems facing the river and work together to come up with new ideas to protect and restore water quality in their community. The meetings were publicized through notices to local media outlets, email announcements, invitations mailed to riparian landowners, and fliers posted throughout the watersheds. The meetings included a presentation by VADEQ staff on current water quality issues in the watersheds and development of the plan. This presentation was followed by breakout sessions to collect local input on characteristics of the watersheds and ideas regarding what to include in the plan. Approximately 45 people attended the two meetings. In addition, an informational meeting was held with a small group of landowners and partner organizations prior to kicking off the project in order to identify suitable meeting locations, key issues, and other unique watershed characteristics that had the capacity to greatly influence the planning process. A final public meeting was held on January 14, 2016 at Walton Middle School to present the completed draft plan to the public and collect local input. Over XX people attended.

4.2 Agricultural Working Group

The role of the Agricultural Working Group was to review conservation practices and outreach strategies from an agricultural perspective, identify any obstacles (and solutions) related to BMP implementation, and to provide estimates on the type, number, and costs of BMPs.

During the first round of agricultural working group meetings, which were held as breakout sessions during the first two public meetings in March and April, the groups discussed the status of farming in the region and characteristics of typical farms in the watershed. Several attendees noted that estimates of cattle and horses in the watershed that were developed in an earlier study were far too high based on land use changes in the watershed over the last 5-10 years. Suburban encroachment was identified as a real problem in the area. It was noted that there is very little cropland in the watershed any more, and that over the past 20 years, the cattle population in the watershed has declined by about 50%. This is largely due to the fact that until last year, cattle have not been economically profitable for many farmers in the region. It was noted that some pasture in the watershed is leased for grazing, but not a very large amount. There is a lot of fallow pasture in the watershed along with quite a few 10-20 acre parcels that are bush hogged or cut for hay in order to keep the land in ag land use for tax purposes. A number of these smaller property owners have removed boundary fencing on their property with the intention of solely using the land for hay.

Participants completed a survey regarding potential BMPs to include in the plan and obstacles to livestock exclusion in the watershed. Livestock exclusion from streams and rotational grazing were ranked as the highest priority practices by participants, while forestation of crop and pasture land and equine manure storage/composting were ranked as the lowest priority. The greatest obstacles to livestock exclusion identified in the survey were giving up land for a 35-foot buffer and the cost of installation. Flooding was identified as another deterrent to stream exclusion fencing as you move further downstream in the watershed. Private funds from a foundation have been used to install fencing in the watershed in the past, but this only went so far. The groups also discussed the best methods of outreach to the local agricultural community including partnering with the local Farm Bureau, and with VA Cooperative Extension. Postcard mailings and brochures were also identified as good ways to share information. The local Master Gardeners chapter has had great success with distributing brochures in displays that they have set up at local plant nurseries, Southern States and Lowes Garden Center. A brochure could be developed for the Hardware River watershed that identifies the water

quality issues facing the river along with the types of practices that need to be done to correct the problem.

It was also suggested that new landowners could be directed to active farms to see how agricultural best management practices actually work. Water testing was suggested as a good outreach tool in terms of communicating the benefits of conservation practices and getting volunteers from the local community involved.

A second meeting was held on June 11, 2015 at Walton Middle School. During this meeting, the group reviewed a series of BMP implementation scenarios and associated costs, and identified a time line for implementation. The group discussed the inclusion of BMPs to address bacteria from horse farms. A small number of equine manure composters were included Stage 1 in the handout shown to participants. Participants felt that there could be a few farms that would benefit from installation of barnyard runoff controls as well. The group discussed the extent of pasture management needed in the watersheds in order to address runoff of bacteria from pasture. DEQ staff noted that water control structures and reforestation of erodible pasture BMPs may be necessary in order to get the bacteria levels low enough in the river to remove the river from the impaired waters list. Participants felt that most farmers would not be interested in the reforestation of erodible pasture practice and that water control structures would be very unpopular in the community and would require unique conditions to really be applicable to many operations. During the discussion about an appropriate timeline, participants wanted to make sure that the time line was short enough to demonstrate that the community was serious about improving water quality in the Hardware River. Participants agreed on a two-stage implementation process, with each stage lasting approximately five years. Concerns were expressed regarding how a backlog of livestock exclusion practices to be funded with 100% cost share through the VA Agricultural BMP Cost Share Program might impact the time line and availability of financial support for implementation efforts. The 100% cost share program ended on June 30, 2015; however, practices signed up prior to this date are to be honored through the state program as funds become available. Participants were concerned that this could interfere with implementation efforts in the Hardware River, but ultimately decided to plan to move directly into implementation following completion of the plan.

4.3 Residential Working Group

The primary role of the Residential Working Group (RWG) was to discuss methods needed to reduce human and pet sources of bacteria entering the creeks, recommend methods to identify and correct or replace failing septic systems and straight pipes, and provide input on the BMPs to include in the plan.

At the first residential working group meeting in Scottsville on March 31, 2015, the residential working group discussed septic system maintenance needs in the community. The group agreed that there is a considerable lack of awareness, with many property owners unable to tell you where their tank is actually located.

One participant noted that it does not seem like there are many houses located along the river going from the Route 6 bridge down to the James River. In addition, there are not many livestock along this reach of the river (around 10 miles

The group thought that a septic tank pumpout program might be applicable in the watershed, but was unsure about any sort of targeting strategies such as focusing on homes within a certain distance of the stream or particular subwatersheds. Due to the clay soils that are present in much of Fluvanna County, many thought that there would not be much development in the area since these soils typically don't perk. However, alternative waste treatment systems have allowed for development in areas with the soils in the county. It was suggested that a handout with maintenance information on septic systems be developed and made available to local landowners at places like the local library in Palmyra and the county Cooperative Extension Service office. It was also suggested that localities should work with the Health Department to require that a property owner have a working septic system in order to receive a building permit. The group discussed the use of alternative waste treatment systems in the watersheds. There are quite a few these days and people don't have a clear understanding of how they work and the maintenance that is involved. There are required inspections and an operation and maintenance manual that must be followed in cases where these systems are used now. The group did not think that there are many opportunities to connect homes with failing septic systems or straight pipes to public sewer.

The group agreed that there are not many opportunities for an outreach program regarding proper pet waste disposal due to the rural nature of the watershed. Walnut Creek Reservoir was identified as a place where people walk their dogs. One participant noted that there are a number of horse trails in the watershed, and suggested that owners/riders could be encouraged to address trail manure.

During the first residential working group meeting in North Garden on April 9, 2015, the group discussed septic system maintenance needs and the degree of awareness in the area regarding what is involved in maintaining these systems. It was noted that there are many new homes/properties in the watershed with new septic systems that are functioning properly. The greater concern lies with the older homes in the area that were built when regulations regarding septic systems were not as stringent. One participant noted that there are a number of residential properties in the watershed that are classified as agricultural where the property owner is just cutting hay. The group discussed potential outreach strategies to share information with residential property owners. Mass mailings were identified as a good tool along with public service announcements on "The Corner" radio station and television stations. Materials could also be posted at local pizza places, wineries and cideries. Participants did not think it would be worthwhile to try to initiate a large scale pet waste education program based on the nature of properties in the watershed. Several participants felt that it might be worthwhile to reach out to any kennels in the watershed though. It was also noted that some people walk their dogs at the local schools (Walker and Red Hill), so they could be considered as potential sites for pet waste stations as well.

Ruritan clubs were identified as another good organization to partner with on outreach efforts. A "septic social" was suggested as a way to make outreach more fun, along with setting up a display at Batesville Day (it should be noted that Batesville is just outside of the watershed, but the event may attract local watershed residents nonetheless).

A second residential working meeting was held at Walton Middle School on June 2, 2015. During this meeting, the group discussed estimates of the extent of septic system repairs and replacements needed in the watershed, and the number of failing systems that would need to be replaced with alternative waste treatment systems. Participants also

discussed the cost estimates for the different types of septic systems and repairs to failing systems. One attendee mentioned that he had recently made repairs to two different septic systems. He performed the repairs using his own equipment and labor, but estimated that if this work had been contracted out, it would have cost around $2,000 in labor and $200 in materials to repair a cracked distribution box and replace clogged drainfield pipes. This matched up well with the estimate shown in the handout of $3,000 for a typical repair. The group estimated that a septic tank pumpout typically costs around $325, but can be upwards of $400 for a very large tank.

Installation of residential riparian buffers was suggested as a potential tool to address runoff from residential land. The group reviewed aerial imagery to try to identify locations for residential buffer plantings. A subdivision near Red Hill Road was identified as one potential location along with some homes located between the railroad and Red High School Road along a tributary of the Hardware. There are 8-10 houses along the river with 2-3 acre lots. Overall, the group thought that opportunities for residential buffers are somewhat limited though.

The group discussed options for targeting of outreach including areas where septic system failures are most likely and agreed that based on experiences that the Thomas Jefferson Soil and Water Conservation District has had with their septic BMP program in Nelson County, it makes sense to cast a wide net rather than concentrating outreach in one portion of the watershed. The Hardware River watershed is not so large that outreach couldn't realistically be conducted to landowners throughout the area.

The group discussed a timeline for implementation. It was agreed that ten years was probably the most realistic timeline for accomplishment of all of the residential septic goals. The group also discussed potential partners in implementation efforts. Septic tank pumpers and contractors who install septic systems were identified as key partners in outreach. Home inspectors were identified as a good partner, though a concerted effort would need to be made to reach out to them. Often times an inspector will sign off on an inspection without even locating the septic system for a property. If a new homeowner

finds a problem with the system after the inspection, it can be detrimental to the inspector's business.

4.4 Steering Committee

The Steering Committee met on November 3, 2015 at the Scottsville Public Library to discuss plans for the final public meeting and to review the draft implementation plan prior to the final public meeting on January 12, 2016. The group provided comments on the draft plan and helped to develop a final agenda for the meeting.

5. IMPLEMENTATION ACTIONS

An important part of the implementation plan is the identification of specific best management practices and associated technical assistance needed to improve water quality in the watersheds. Since this plan is designed to be implemented by landowners on a voluntary basis, it is necessary to identify management practices that are both financially and technically realistic and suitable for this particular community. As part of this process, the costs and benefits of these practices must be examined and weighed. Once the best practices have been identified for implementation, we must also develop an estimate of the number of each practice that would be needed in order to meet the water quality goals established during the TMDL study.

5.1 Identification of Best Management Practices

Potential best management practices, their associated costs and efficiencies, and potential funding sources were identified through review of the TMDL, input from the working groups, and literature reviews. Measures that can be promoted through existing programs were identified, as well as those that are not currently supported by existing programs and their potential funding sources. Some best management practices had to be included in order to meet the water quality goals established in the TMDL, while others were selected through a process of stakeholder review and analysis of their effectiveness in these watersheds. These measures are discussed in sections 5.1.1 and 5.1.2, respectively.

5.1.1 Control Measures Implied by the TMDL

The reductions in bacteria identified by the TMDL study dictated some of the control measures that must be employed during implementation in order to meet the pollutant reductions specified in the TMDL.

Livestock Exclusion

In order to meet the bacteria reductions in direct deposition from livestock, some form of stream exclusion is necessary. Fencing is the most obvious choice; however, the type of fencing, distance from the stream bank, and most appropriate management strategy for the fenced pasture are less obvious. While it is recognized that farmers will want to minimize the cost of fencing and the amount of pasture lost, the inclusion of a streamside

buffer strip helps to reduce bacteria, sediment and nutrient loads in runoff. The incorporation of effective buffers (35 foot minimum width) could reduce the need for more costly control measures. From an environmental perspective, the best management scenario would be to exclude livestock from the stream bank 100% of the time and establish permanent vegetation in the buffer area. This prevents livestock from eroding the stream bank, provides a buffer for capturing pollutants in runoff from the pasture, and establishes (with the growth of streamside vegetation) one of the foundations for healthy aquatic life. From a livestock-production perspective, the best management scenario is one that provides the greatest profit to the farmer. Obviously, taking land (even a small amount) out of production is contrary to that goal. However, a clean water source has been shown to improve milk production and weight gain. Clean water will also improve the health of animals (*e.g.*, cattle and horses) by decreasing the incidence of waterborne illnesses and exposure to swampy areas near streams. State and federal conservation agencies including DCR and the Natural Resources Conservation Service have incorporated livestock exclusion practices into their agricultural cost share programs that offer farmers greater flexibility in fencing options. This flexibility allows farmers with limited pasture acreage to exclude livestock from the stream while not sacrificing a significant amount of land for grazing.

Septic Systems and Straight Pipes

The 100% reduction in loads from straight pipes and failing septic systems is a pre-existing legal requirement. The options identified for correcting straight pipes and failing septic systems included: repair of an existing septic system, installation of a septic system, and installation of an alternative waste treatment system. It is anticipated that a significant portion of straight pipes will be located in areas where an adequate site for a septic drain field is not available. In these cases, the landowner will have to consider an alternative waste treatment system.

5.1.2 Control Measures Selected through Stakeholder Review

In addition to the control measures that were directly prescribed by the TMDLs, a number of measures were needed to control fecal bacteria from land-based sources. Various scenarios were developed and presented to working groups. All scenarios began with the best management practices that were prescribed by the TMDL such as livestock

exclusion and eliminating straight pipes. Next, series of established best management practices were examined by the working groups, who considered both their economic costs and the water quality benefits that they produced. The majority of these practices are included in state and federal agricultural cost share programs that promote conservation.

The final set of BMPs identified and the efficiencies used in this study to estimate needs are listed in Table 5.1.

Table 5.1 Best management practices and associated pollutant reductions

BMP Type	Description	Bacteria Reduction Efficiency	Reference
Direct deposit	Livestock exclusion from waterway	100%	1
Pasture	Streamside buffer (35 feet)	50%	2, 5
	Improved pasture management	50%	3, 5
	Permanent vegetative cover on critical areas	LU change	4
	Reforestation of highly erodible pasture/cropland	LU change	4
	Manure storage/composting (equine)	80%	3
	Barnyard runoff controls (equine)	LU change	4
Cropland	Small grain cover crops	20%	2, 5
	Riparian buffers	40%	2, 5
Hayland	Riparian buffers	40%	2, 5
Straight pipes and septic systems	Septic tank pumpout	5%	6
	Connection to public sewer	100%	1
	Septic system repair	100%	1
	Septic system replacement	100%	1
	Alternative waste treatment system	100%	1
Residential	Pet waste disposal station	100%	1
	Riparian buffers	40%	2, 5

References

1. Removal efficiency is defined by the practice
2. Bacteria efficiency assumed to be equal to sediment efficiency.
3. VADCR and VADEQ. 2003. Guidance manual for Total Maximum Daily Load Implementation Plans. Available at:

www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/TMDLImplementationPlanGuidanceManual.aspx

4. Based on differential loading rates to different land uses.
5. Chesapeake Assessment Scenario Tool - BMP effectiveness values by land use and HGMR and pollutant
6. Bacteria efficiency assumed equal to nitrogen removal efficiency - Chesapeake Assessment Scenario Tool - BMP effectiveness values by land use and HGMR and pollutant

5.2 Quantification of Control Measures

The quantity of control measures recommended during implementation was determined through spatial analyses, modeling alternative implementation scenarios, and using input from the working groups. Data on land use, stream networks, and elevation were used in spatial analyses to develop estimates of the number of control measures recommended overall, in each watershed, and within smaller subwatersheds. Data from the VADCR Agricultural BMP Database and the Thomas Jefferson SWCD showing where best management practices are already in place in the watersheds were considered when developing these estimates. In addition, census data were used in order to quantify septic system repairs and replacements needed in order to meet the reductions specified in the TMDL. Estimates of the amount of residential on-site waste treatment systems, streamside fencing and number of full livestock exclusion systems were made through these analyses. The quantities of additional control measures were determined through modeling alternative scenarios and applying the related pollutant reduction efficiencies to their associated bacteria loads.

Implicit in the TMDL is the need to avoid increased delivery of pollutants from sources that have not been identified as needing a reduction, and from sources that may develop over time. One potential for additional sources of the pollutants identified is future residential development. Care should be taken to monitor development and its impacts on water quality. Where residential development occurs, there is potential for additional pollutant loads from failing septic systems, sewer line overflows and leaks.

5.2.1 Agricultural Control Measures

Livestock Exclusion BMPs

The TMDL reduction scenario shown in Table 3.6 on page 18 includes recommendations of a 100% reduction in direct deposition of manure in the Hardware River and the North Fork Hardware River. In addition, a 99% reduction in bacteria from pasture is needed in the watersheds, and a 10% reduction in bacteria from cropland. Consequently, this plan includes recommendations for livestock exclusion practices implemented in conjunction with improved pasture management and cropland BMPs. To estimate fencing needs, the perennial stream network was overlaid with land use using GIS mapping software (ArcView v.10.1). Stream segments that flowed through or were adjacent to land use areas that had a potential for supporting cattle (*e.g.,* pasture) were identified using 2011 VBMP Orthophotography and the 2011 National Hydrography Dataset (NHD) streams layer. Not every land-use area identified as pasture has livestock on it at any given point in time. However, it is assumed that all pasture areas have the potential for livestock access. Land use data from the 2014 Non Point Source Pollution Assessment (VADCR, 2014) was used in order to determine the ratio of pasture to hay land in the watersheds since these land uses are not easily differentiated using GIS mapping and aerial imagery. This ratio was used to adjust fencing estimates so that land used solely to cut hay was not included in the fencing calculations. If the stream segment flowed through the resulting land-use area, it was assumed that fencing was needed on both sides of the stream. If a stream segment flowed adjacent to the land-use area, it was assumed that fencing was required on only one side of the stream. Following GIS analyses of fencing needs, the VADCR Agricultural BMP Database was queried to identify the amount of livestock exclusion systems already in place in the watershed. Any fencing installed was subtracted from the length of potential fencing in the watershed (Table 5.1). A total of 29.3 miles of fencing was installed in the watersheds between 1998 and 2014. Once estimates were completed, they were compared with the results of a stream survey conducted by the Thomas Jefferson SWCD in 2009. The SWCD identified properties in the watershed where livestock had direct access to the stream by floating the river and collected coordinate data for those properties. The survey data was used to make several small adjustments to the fencing estimates, though overall, the two datasets matched up

well. A map of potential streamside fencing required for streams in the watersheds is shown in Figure 5.1.

Table 5.1 Livestock exclusion systems in the watershed tracked through the VADCR Agricultural BMP database: *November 1998 – November 2014*. NOTE: Table does not include data from systems that were not installed through government cost share programs. CRP and EQIP data were not available.

Subwatershed	Practice	Extent installed (linear ft)	Total # of practices	Cost share ($)
Hardware River	Stream exclusion with grazing land management (SL-6)	46,523	17	$215,923
	CREP Grazing land protection (CRSL-6)	N/A*	2	$3,180
SF Hardware River	CREP Streambank Protection (CRWP-2)	1,150	1	$1,725
	Stream exclusion with grazing land management (SL-6)	15,771	4	$112,153
NF Hardware River	Stream exclusion with grazing land management (SL-6)	90,268	12	$493,214
	CREP buffer length recording (CRLF-1)	41,255	2	N/A**
TOTALS		**153,814**	**38**	**$826,195**

*Extent installed included in SL-6 total
**Data not available

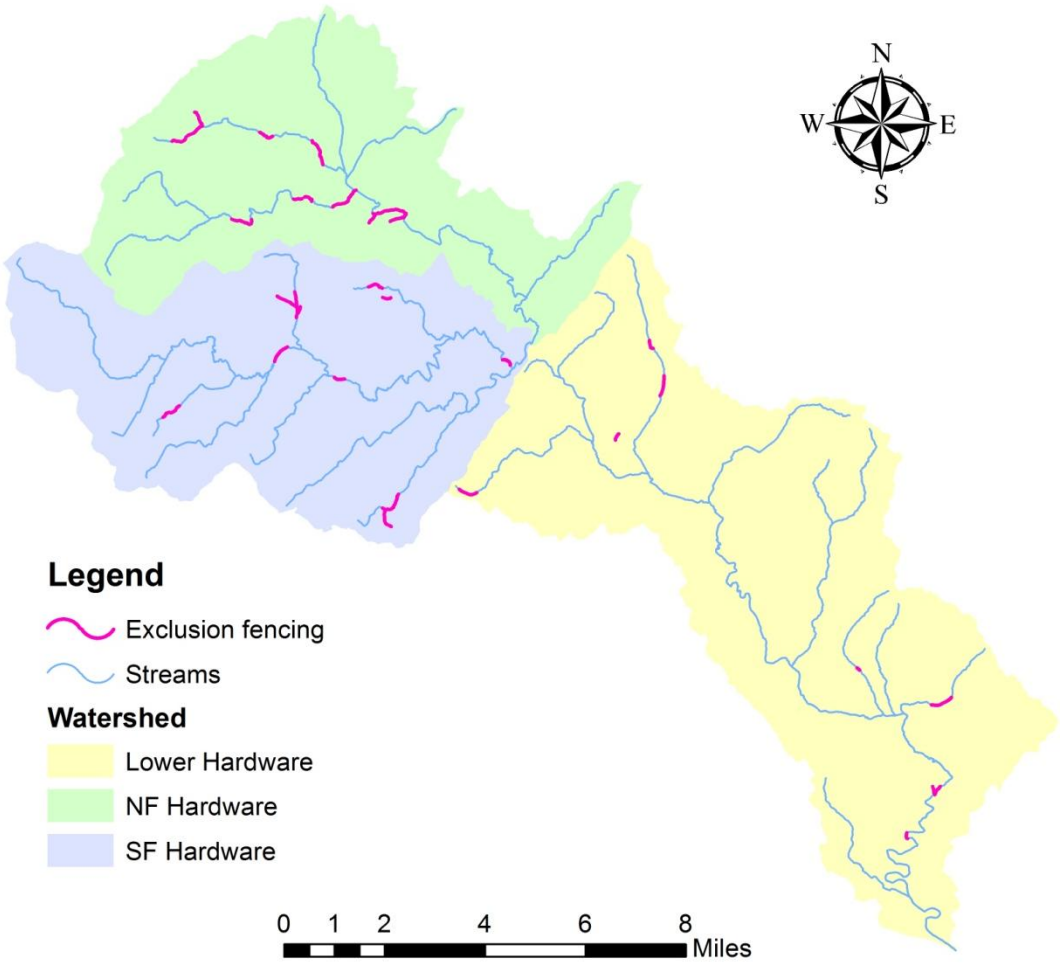

Figure 5.1 Potential stream exclusion fencing by subwatershed

It is expected that the majority of livestock exclusion fencing will be accomplished through the VA Agricultural BMP Cost Share Program and federal NRCS cost-share programs. Some applicable cost-shared BMPs for livestock exclusion in the programs are the SL-6T (Stream Exclusion with Grazing Land Management for TMDL Implementation Practice), the LE-1T (Livestock Exclusion with Riparian Buffers for TMDL Implementation), the LE-2T (Livestock Exclusion with Reduced Setback for TMDL Implementation), and CREP (the Conservation Reserve Enhancement Program). In order to determine the appropriate mix of these practices to include in the implementation plan, tax parcel data was utilized in conjunction with local data from the VADCR Agricultural BMP Database to determine typical characteristics (e.g., streamside fencing length per practice) of livestock exclusion systems in the region. In addition, input was collected from the Agricultural Working Group, NRCS and the Thomas

Jefferson SWCD regarding typical components of each system, associated costs, and preferred fencing setbacks. These characteristics were then utilized to identify the mix of fencing practices available through state and federal cost share programs to include in the implementation plan (Table 5.2).

The Stream Exclusion with Grazing Land Management for TMDL Implementation Practice (SL-6T) offers 75% cost share for off stream watering, establishment of a rotational grazing system, stream crossings, and stream exclusion fencing with a 35 foot setback (required). The LE-1T (Livestock Exclusion with Riparian Buffers for TMDL Implementation) is very similar to the SL-6T except that 85% cost share is provided and applicants may not receive funding to install hardened winter feeding pads. It was estimated that approximately 60% of fencing would be installed using these practices.

The Livestock Exclusion with Reduced Setback Practice (LE-2T) only requires a 10 foot setback for stream fencing. Cost share is provided for stream fencing and cross fencing, stream crossings, and off stream waterers at a rate of 50%. It was estimated the 15% of livestock exclusion would be accomplished through the LE-2T practice.

Fencing through the Conservation Reserve Enhancement Program (CREP) was also included in implementation scenarios. Based on input from NRCS and SWCD staff, it was determined that landowners who are willing to install fencing with a larger setback often decide to use CREP due to the higher incentive and rental payments. Consequently, it was estimated that 25% of fencing would be installed through this federal program.

Table 5.3 Stream fencing needs summary

Watershed	Sub-watershed	Fencing needed (ft)	Fencing needed (miles)	Systems needed*
Hardware River	HRD-03	3,229	0.61	2
	HRD-06	746	0.14	1
	HRD-08	4,792	0.91	1
	HRD-19	3,706	0.70	2
	HRD-20	4,062	0.77	1
	HRD-22	1,055	0.22	1
	Subtotals	***17,590***	***3.33***	***8***

Watershed	Sub-watershed	Fencing needed (ft)	Fencing needed (miles)	Systems needed*
North Fork Hardware River	NFH-02	8,918	1.69	1
	NFH-05	17,289	3.27	7
	NFH-06	11,851	2.24	6
	Subtotals	***38,058***	***7.21***	***14***
South Fork Hardware River	SFH-01	2,398	0.45	1
	SFH-04	8,975	1.70	2
	SFH-05	1,157	0.22	1
	SFH-06	5,206	0.99	2
	SFH-07	10,706	2.03	1
	SFH-08	5,987	1.13	2
	Subtotals	***34,429***	***6.52***	***9***
TOTALS		***90,077***	***17***	***31***

Table 5.3 Estimate of streamside exclusion fencing systems needed by subwatershed

Sub-watershed	SL-6T/LE-1T fencing		LE-2T fencing		CREP fencing	
	Linear feet	Systems	Linear feet	Systems	Linear feet	Systems
Hardware River						
HRD-03	1,918	1.2	480	0.3	799	0.5
HRD-06	443	0.6	111	0.15	185	0.25
HRD-08	2,846	0.6	712	0.15	1,186	0.25
HRD-19	2,201	1.2	550	0.3	917	0.5
HRD-20	2,413	0.6	603	0.15	1,005	0.25
HRD-22	627	0.6	157	0.15	261	0.25
Subtotals	***10.448***	***4.8***	***2,613***	***1.2***	***4,353***	***2.0***
North Fork Hardware River						
NFH-02	5,297	0.6	1,324	0.15	2,207	0.25
NFH-05	10,270	4.2	2,567	1.05	4,279	1.75
NFH-06	7,039	3.6	1,760	0.9	2,933	1.5
Subtotals	***22,606***	***8.4***	***5,652***	***2.1***	***9,419***	***3.5***
South Fork Hardware River						
SFH-01	1,438	0.6	360	0.15	599	0.25
SFH-04	5,382	1.2	1,346	0.3	2,243	0.5
SFH-05	694	0.6	173	0.15	289	0.25
SFH-06	3,122	1.2	781	0.3	1,301	0.5
SFH-07	6,420	0.6	1,605	0.15	2,675	0.25
SFH-08	3,590	1.2	898	0.3	1,496	0.5
Subtotals	***20,647***	***5.4***	***5,162***	***1.35***	***8,603***	***2.25***
TOTALS	***53,702***	***18.6***	***13,425***	***4.65***	***22,376***	***7.75***

Land Based Agricultural BMPs

In order to meet the bacteria reductions outlined in the TMDLs, best management practices to treat land-based sources of the pollutants must also be included in implementation efforts. Table 5.9 provides a summary of land based agricultural BMPs by watershed needed to achieve water quality goals.

Grazing Systems and Improved Pasture Management

Establishment of rotational grazing systems for cattle was recommended in conjunction with livestock exclusion projects. The majority of fencing programs will provide cost share for the establishment of cross fencing and alternative watering sources in order to establish these systems. In cases where livestock exclusion is not necessary, improved pasture management was prescribed. Like a grazing system, improved pasture management allows a farmer to better utilize grazing land and associated forage production. Improved pasture management includes:

- Implement a current nutrient management plan
- Maintain adequate soil nutrient and pH levels
- Manage livestock rotation to paddock subdivisions to maintain minimum grazing height recommendations and sufficient rest periods for plant recovery
- Maintain adequate and uniform plant cover ($\geq$ 60%) and pasture stand density
- Locate feeding and watering facilities away from sensitive areas
- Manage distribution of nutrients and minimize soil disturbance at hay feeding sites by unrolling hay across the upland landscape in varied locations
- Designate a sacrifice lot/paddock to locate cattle for feeding when adequate forage is not available in the pasture system. Sacrifice lot/paddock should not drain directly into ponds, creeks or other sensitive areas and should not be more than 10% of the total pasture acreage.
- Chain harrow pastures to break-up manure piles after livestock are removed from a field at least twice a year to uniformly spread the manure load, or manage manure distribution through rotational grazing

Permanent Vegetation on Critical Areas

This practice supports land shaping and planting permanent vegetative cover on critically eroding areas. This may include measures such as grading, shaping, and filling, the establishment of grasses, and trees or shrubs. Landowners may receive up to 75% cost share for this practice and must maintain the practice for a period of five years. This practice is particularly applicable in highly denuded areas where concentrated runoff of manure is occurring.

Reforestation of Pasture Land

This practice includes the planting of trees on land that is currently being used as pasture in order to make a land use conversion to forest. Under this practice, landowners must maintain the established forest cover for a period of 10-15 years in order to receive an incentive payment of $25-$50/acre, respectively. The establishment of trees on existing pasture will result in improved water quality by reducing surface runoff and increasing nutrient uptake. This practice was modeled as a land use conversion using estimated unit area loads for pasture and forest land uses in the watershed to demonstrate associated bacteria reductions.

Riparian Buffers

For modeling purposes, it was assumed that a typical vegetative buffer would be able to receive and treat runoff from an area two times its width. For example, a buffer that was 35 feet wide and 1,000 feet long would treat runoff from an area that was 70 feet wide and 1,000 feet long. Once you move beyond two times the buffer width, it was assumed that the runoff would be in the form of channelized flow rather than the sheet flow that a buffer can trap.

Barnyard Runoff Controls

The agricultural working group recommended that small acreage grazing systems recommended for horse farms be limited since many horse owners will be unlikely to implement a rotational grazing system. Working group members recommended focusing more on highly denuded areas around barnyards on horse farms, suggesting that the majority of pollution making its way to the streams is coming from these areas where livestock are spending the greatest amount of time. Barnyard runoff controls include:

- Installation of a sacrifice area (625 ft^2/horse)
- Diversion of runoff from barn roof tops
- Protection of heavy use areas including travel lanes with gravel and filter fabric

Details on effective management strategies for horse barnyards and associated costs were gathered from the recent project completed by the Prince William SWCD: Chesapeake Bay-Friendly Horse Farm Project (www.pwswcd.org/horse-owners.html).

Cropland Management Practices

There is a limited amount of cropland available in the watershed for cropland BMPs; however, a small amount of cover crops and riparian buffers are included in the plan. Cover crops are planted on an annual basis in order to prevent soil erosion following harvest of crops like corn and soybeans when the soil would typically be left exposed. Landowners can receive an annual incentive payment for planting cover crops in accordance with a specified schedule through the VA BMP cost share program.

Table 5.9 Land based agricultural BMPs needed to reach the TMDL

Land use	BMP	Acres (unless otherwise noted)		
		Hardware River	NF Hardware River	TOTAL
Pasture	Improved pasture management	6,308	1,155	7,463
	Grazing land management	1,113	204	1,317
	Permanent vegetation on critical areas	41	11	52
	Reforestation of pasture	206	33	239
	Barnyard runoff control (equine)*	1	1	2
	Manure storage/composting (equine)*	1	1	2
	Riparian buffers (10 foot)	1.78	1.3	3.08
	Riparian buffers (35 foot)	24.98	18.16	43.15
	Riparian buffers (100 foot)	29.74	21.62	51.37
Hayland	Riparian buffers (forested, 35 foot))	3.29	3.59	6.88
Cropland	Riparian buffers (grass, 35 foot)	9.03	0.85	9.88
	Riparian buffers (forested, 35 foot)	9.03	0.84	9.87
	Cover crops (annual acreage)	40	10.92	50.92

*Systems

5.2.2 Residential Control Measures

Failing Septic Systems and Straight Pipes

All straight pipes and failing septic systems must be identified and corrected during implementation based on preexisting legal requirements. Table 5.11 shows the estimated number of failing septic systems and straight pipes by watershed. The number of potential straight pipes in the Hardware River watershed was estimated in the associated TMDL using 2000 U.S. Census Bureau block demographics. The number of failing septic systems in the watershed was estimated based on the age of homes and standard failure rates for septic systems of that age. Homes with septic systems were broken into three age categories (prior to 1974, 1974-1980, or after 1980) based on 2000 census block group data. The percentage of homes within each age category was calculated for each census block group and these percentages were applied to the homes in each subwatershed based on the block group that had the greatest coverage of the sub-watershed. Septic system failure rates for houses pre-1970, 1970-1989, and post- 1989 were assumed to be 40%, 10%, and 2%, respectively. Based this criterion, there is an estimated 114 failing septic systems in the North Fork Hardware River watershed and 349 in the Hardware River watershed (DEQ, 2015).

Of the houses in the old category (pre-1974), 2% were estimated to have straight pipes. Based on this criterion, it was estimated that 11 houses with straight pipes exist in the Hardware River watershed and 6 exist in the North Fork Hardware River watershed.

Table 5.11 Failing septic systems and straight pipes in the watersheds

Watershed	Total Septic Systems	Estimated Failing Septic Systems	Estimated Straight Pipes
Hardware River	1,416	349	29
NF Hardware River	454	114	11
TOTAL	**1,879**	**463**	**40**

Based on data collected from an existing septic system cost share program in nearby Nelson County, it was estimated that 20% of failing septic systems could be corrected with a repair, the remaining 80% would need to be replaced. Of the systems that need to be replaced, a portion will require alternative waste treatment systems due to the geology

present at the site, or a lack of space necessary for a conventional drainfield. Table 5.12 shows a breakdown of the septic system and straight pipe replacements based on input from the Albemarle County Health Department. No opportunities were identified for connections to public sewer in the watersheds. Based on existing conditions, it was estimated that approximately 43% of septic system replacements would be done with alternative waste treatment systems, 35% could be done using conventional septic systems, and the remaining 22% could be corrected with a conventional septic system with a pump. Because homes with straight pipes are more likely to have conditions that do not allow for installation of a conventional drainfield (older homes, smaller lots, home is located close to the stream), it was estimated that only 30% of straight pipes in the watershed could be corrected with the installation of a conventional system. Of the remaining straight pipes, it was estimated that 70% would need to be replaced with an alternative waste treatment system. A septic tank pumpout program was also discussed as a good way to heighten local awareness of septic system maintenance needs and to locate failing septic systems. Such a program could be implemented on a limited basis, targeting homes in close proximity to the creeks. The estimates shown in Table 5.12 are based on pumping out septic tanks for 25% of households in each watershed.

Table 5.12 Repairs and replacements of failing septic systems and straight pipes

Watershed	Septic system repair	Replace with conventional system	Replace with conventional system with pump	Replace with alternative system	Septic tank pumpout
Hardware River	70	109	67	132	354
NF Hardware River	23	36	22	44	114
TOTAL	**95**	**145**	**89**	**176**	**468**

Residential Stormwater and Pet Waste BMPs

Bacteria running off of residential land from pet waste and failing septic systems must also be addressed. Due to the largely agricultural land base of the watersheds, opportunities for residential stormwater and pet waste BMPs are relatively limited. However, several opportunities were identified for pet waste disposal stations in the watershed including Walnut Creek Reservoir, Red Hill Elementary School and Walker Middle School. In addition, a small amount of residential property next to the river was

identified for potential riparian buffer installations. These buffers could be designed and planted as attractive landscape features by selecting the right plants. Partners in this effort could include groups like Virginia Master Gardeners and Master Naturalists, who could work with landowners to design a buffer that blends in with their existing landscaping.

Table 5.13 Residential/pet waste BMPs

BMP	Units	Extent	
		Hardware River	NF Hardware River
Riparian buffers	Acres	0	6.9
Pet waste stations	Stations	2	1

5.3 Technical Assistance and Education

In order to get landowners involved in implementation, it will be necessary to initiate education and outreach strategies and provide technical assistance with the design and installation of various best management practices. There must be a proactive approach to contact farmers and residents to articulate exactly what the TMDL means to them and what practices will help meet the goal of improved water quality. The working groups recommended several education/outreach techniques, which will be utilized during implementation.

The following general tasks associated with agricultural and residential programs were identified:

Agricultural Programs

- Make contact with landowners in the watersheds to make them aware of implementation goals, cost-share assistance, and voluntary options that are available to agricultural producers interested in conservation
- Provide technical assistance for agricultural programs (*e.g.*, survey, design, layout, and approval of installation).
- Handle and track cost-share
- Assess and track progress toward BMP implementation goals

- Coordinate use of existing agricultural programs and suggest modifications
- Give presentations at local Farm Bureau events including annual membership meetings, August and October field days (Fluvanna County) and regular board meetings. Provide information for distribution with semiannual newsletters.
- Organize educational programs for farmers including farm tours in partnership with VA Cooperative Extension and Farm Bureau. Reach out to new landowners so that they can learn more about how agricultural BMPs work.
- Conduct mailings to agricultural landowners. Include contact information for organizations that provide assistance with BMP implementation (technical and financial).
- Partner with the local Master Gardeners chapter to distribute informational materials. Develop a brochure that could be placed in the display racks that the group has set up at local plant nurseries, Lowes Garden Center and Southern States.
- Partner with a local landowner who recently established an instructional farm in the watershed for the purposes of demonstrating regenerative agricultural practices such as rotational grazing and hosting other educational workshops with guest speakers.

Residential Programs

- Identify straight-pipes and failing septic systems (*e.g.*, contact landowners in older homes, septic pump-out program)
- Handle and track cost-share
- Assess progress toward implementation goals
- Develop and distribute educational materials (e.g. septic system maintenance guide). Potential locations identified included the VA Cooperative Extension Office, local libraries, local pizza places, wineries and cideries. Conduct mass mailings to distribute materials to homeowners.
- Hold a "septic social" in the watershed to share maintenance information with property owners.
- Develop public service announcements to run on local radio stations such as "The Corner."
- Establish signs along horse trails encouraging proper disposal of manure.
- Set up a display at Batesville Day. While Batesville is not located within the watershed, it is typically attended by property owners throughout the surrounding area.
- Reach out to local kennels in the watershed to share information on pet waste management.
- Consider development of a local ordinance that requires a homeowner to pump out their septic tank before transferring ownership of a property.
- Form partnerships with local realtors, building inspectors, and community groups such as the Ruritans to distribute educational information on septic system maintenance to homeowners.

A critical component in the successful implementation of this plan is the availability of knowledgeable staff to work with landowners on implementing conservation practices. While this plan provides a general list of practices that can be implemented in the watershed, property owners face unique management challenges including both design challenges and financial barriers to implementation of practices. Consequently, technical assistance from trained conservation professionals is a key component to successful BMP implementation. Technical assistance includes helping landowners identify suitable BMPs for their property, designing BMPs and locating funding to finance implementation.

The staffing level needed to implement the agricultural and residential components of the plan was estimated based on discussions with stakeholders and the staffing levels used in similar projects. Staffing needs were quantified using full time equivalents (FTE), with one FTE being equal to one full-time staff member. Thomas Jefferson SWCD staff shared information on staff time spent implementing the Rockfish River TMDL Implementation Plan, which is located in neighboring Nelson County. One position has been created for this effort. A comparative analysis of the two watersheds and BMPs needed to meet TMDL goals was performed. Based on this analysis and discussions with the working groups, it was determined that 1 FTE would be sufficient in order to provide the technical assistance needed for agricultural and residential implementation. A twelve year timeline has been identified for implementation efforts (see Chapter 7). The full FTE will be needed during the first ten years of implementation. Based on the reduced extent of BMP implementation included in the final two years of implementation, a ½ FTE should be sufficient to accomplish remaining BMP goals. The Thomas Jefferson SWCD has staff currently working in Nelson, Albemarle, Fluvanna and Louisa Counties. Consequently, outreach and technical assistance with design and implementation of a portion of agricultural BMPs included in the implementation plan could be handled by existing staff at the SWCD. However, in order to fully achieve agricultural and residential BMP implementation goals within the timeline established in Chapter 7 of this plan, an additional FTE will be required. This position could be housed at the Thomas Jefferson SWCD if the organization elects to pursue implementation of this plan for the Hardware River.

6. COSTS AND BENEFITS

6.1 Agricultural BMPs

The costs of agricultural best management practices included in the implementation plan were estimated based on data for Albemarle and Fluvanna Counties from the VADCR Agricultural BMP Database, the NRCS and Thomas Jefferson SWCD cost lists for BMP components, and considerable input from Thomas Jefferson SWCD and NRCS staff.

The total cost of livestock exclusion systems includes not only the costs associated with fence installation, repair, and maintenance, but also the cost of developing alternative water sources for SL-6T, LE-1T, LE-2T, and CREP. The cost of fence maintenance was identified as a deterrent to participation. Financial assistance possibilities for maintaining fences include an annual 25% tax credit for fence maintenance, and an upfront incentive payment on $0.50 per linear foot to maintain stream fencing as part of the WP-2T practice. Typically the average cost of fence maintenance is significantly higher, and as a result, interest in the WP-2T practice in the watersheds has been very low to date. In developing the cost estimates for fence maintenance shown in Table 6.1, a figure of $3.50/linear foot of fence was used. It was estimated that approximately 10% of fencing would need to be replaced over a 15 year contract (e.g. CREP) and 6.5% over a 10 year contract (SL-6T/LE-1T/LE-2T).

The majority of agricultural practices recommended in the implementation plan are included in state and federal cost share programs. These programs offer financial assistance in implementing the practices and may also provide landowners with an incentive payment to encourage participation. Consequently, both the potential cost to landowners and the cost to state and federal programs must be considered. Table 6.1 shows total agricultural BMP costs by watershed.

6.2 Residential BMPs

The costs of recommended residential septic BMPs were estimated using input from the Albemarle and Fluvanna County Health Departments and the residential working group (Table 6.2). Riparian buffer and pet waste station costs were estimated based on average costs identified in other project areas where implementation is underway.

Total BMP implementation costs are shown in Table 6.3. In Table 6.4, implementation costs are shown for two stages of implementation. These stages and the associated timeline are explained in greater detail in Chapter 7, Section 7.1.

Table 6.1 Agricultural BMP implementation costs by watershed

Practice	Cost share code	Units	Unit cost	Cost by Watershed		
				Hardware River	NF Hardware River	TOTAL
Livestock exclusion with riparian buffers (35 ft)	LE-1T	system	$37,941	$390,265	$305,302	$695,567
Livestock exclusion with riparian buffers (100 ft)	CRSL-6/SL-7	system	$41,330	$177,287	$137,964	$315,251
Livestock exclusion with reduced setback	LE-2T	system	$37,194	$95,623	$74,913	$170,536
Exclusion fence maintenance (10 yrs)	N/A	feet	$3.50	$13,374	$9,725	$23,099
Improved pasture management	EQIP (529,512), SL-10T	acres	$100	$630,800	$115,500	$746,300
Grazing land management	SL-9	acres	$225	$250,425	$45,900	$296,325
Reforestation of pasture	FR-1	acres	$185	$38,110	$6,105	$44,215
Critical area stabilization	SL-11	acres	$2,440	$100,040	$26,840	$126,880

Manure storage facility (equine)	N/A	facility	$15,000	$15,000	$15,000	$30,000
Barnyard runoff controls (equine)	N/A	system	$20,000	$20,000	$20,000	$40,000
Riparian buffers on hay land (forested)	FR-3	acres	$1,500	$4,935	$5,385	$10,320
Riparian buffers on cropland (grass)	FR-3	acres	$165	$1,490	$140	$1,630
Riparian buffers on cropland (forested)	WQ-1	acres	$1,500	$13,545	$1,260	$14,805
Small grain cover crops	SL-8B	acres	$55*	$2,200	$601	$2,801
TOTAL ESTIMATED COST				**$1,753,093**	**$764,636**	**$2,517,729**

*Annual cost

Table 6.2 Residential BMP implementation costs by watershed

Practice	Cost share code	Units	Unit cost	Cost by Watershed		
				Hardware River	NF Hardware River	TOTAL
Septic tank pumpouts	RB-1	pumpout	$325	$115,050	$36,888	$151,938
Septic system repair	RB-3	repair	$3,000	$209,400	$68,400	$277,800
Septic system replacement	RB-4	system	$8,000	$872,400	$286,800	$1,159,200
Septic system replacement w/pump	RB-4P	system	$10,000	$671,700	$221,700	$893,400
Alternative waste treatment system	RB-5	system	$25,000	$3,299,500	$1,104,500	$4,404,000
Pet waste stations	PW-1	station	$350	$700	$350	$1,050
Riparian buffers	N/A	acres	$3,500	$0	$24,255	$24,255
TOTAL ESTIMATED COST				**$5,168,750**	**$1,742,893**	**$6,911,643**

Table 6.3 Total BMP implementation costs by watershed

BMP Type	Cost by Watershed		
	Hardware River	NF Hardware River	TOTAL
Agricultural	$1,753,093	$764,636	$2,517,729
Residential	$5,168,750	$1,742,893	$6,911,643
TOTAL	**$6,921,843**	**$2,507,529**	**$9,429,372**

Table 6.4 Phased BMP implementation costs

Phase	Hardware River Watershed			North Fork Hardware River Watershed			*TOTAL*
	Agricultural BMPs	Residential BMPs	TOTAL	Agricultural BMPs	Residential BMPs	TOTAL	
Phase 1 (Yrs 1-5)	$1,386,323	$4,135,140	$5,521,463	$708,381	$1,399,235	$2,107,616	***$7,629,079***
Phase 2 (Yrs 6-10)	$336,771	$1,033,610	$1,400,381	$0	$343,658	$343,658	***$1,744,039***
Phase 3 (Yrs 11-12)	$0	$0	$0	$56,255	$0	$56,255	***$56,255***
TOTAL	**$1,753,093**	**$5,168,750**	**$6,921,843**	**$764,636**	**$1,742,893**	**$2,507,529**	***$9,429,372***

6.5 Technical Assistance

Technical assistance costs were estimated for one full time for ten years and one half time position for two years using a cost of $60,000/position per year. This figure is based on the existing staffing costs included in the Virginia Department of Environmental Quality's grant agreement with the Thomas Jefferson Soil and Water Conservation District for the Rockfish River watershed. Based on the 12 year timeline of this plan (described in great detail in the Implementation Timeline section of this plan), this would make the total cost of technical assistance approximately $660,000. When factored into the cost estimate for BMP implementation shown in Table 6.3, this would make the total cost of implementation approximately $10.09M.

6.6 Benefit Analysis

The primary benefit of implementing this plan will be cleaner water in the Hardware River and its tributaries. Specifically, *E. coli* contamination in the creeks will be reduced to meet water quality standards. It is hard to gage the impact that reducing *E. coli* contamination will have on public health, as most cases of waterborne infection are not reported or are falsely attributed to other sources. However, because of the reductions required, the incidence of infection from *E. coli* sources through contact with surface waters should be reduced considerably.

An important objective of the implementation plan is to foster continued economic vitality. This objective is based on the recognition that healthy waters improve economic opportunities for Virginians and a healthy economic base provides the resources and funding necessary to pursue restoration and enhancement activities. The agricultural and residential practices recommended in this document will provide economic benefits to the community, as well as the expected environmental benefits. Specifically, alternative (clean) water sources, exclusion of cattle from streams, improved pasture management, and private sewage system maintenance will each provide economic benefits to land owners. Additionally, money spent by landowners and state agencies in the process of implementing this plan will stimulate the local economy.

6.6.1 Agricultural Practices

It is recognized that every farmer faces unique management challenges that may make implementation of some BMPs more cost effective than others. Consequently, costs and benefits of the BMPs recommended in this plan must be weighed on an individual basis. The benefits highlighted in this section are based on general research findings. Additional economic costs and benefits analyses of these practices at the local level was identified as a much needed outreach tool by the steering committee and agricultural working group.

Restricting livestock access to streams and providing them with clean water source has been shown to improve weight gain and milk production in cattle (Zeckoski et al., 2007). Studies have shown that increasing livestock consumption of clean water can lead to increased milk and butterfat production and increased weight gain (Landefeld et al, 2002). Table 6.5 shows an example of how this can translate into economic gains for producers. Fresh clean water is the primary nutrient for livestock with healthy cattle consuming, on a daily basis, close to 10% of their body weight during winter and 15% of their body weight in summer. Many livestock illnesses can be spread through contaminated water supplies. For instance, coccidia can be delivered through feed, water and haircoat contamination with manure (VCE, 2000). In addition, horses drinking from marshy areas or areas where wildlife or cattle carrying Leptospirosis have access tend to have an increased incidence of moonblindness associated with Leptospirosis infections (VCE, 1998b). A clean water source can prevent illnesses that reduce production and incur the added expense of avoidable veterinary bills.

Table 6.5 Example of increased revenue due to installing off-stream waterers (Surber et al., 2005)

Typical calf sale weight	Additional weight gain due to off-stream waterer	Price	Increased revenue due to off stream waterer
500 lbs/calf	5% or 25 lbs	$0.60 per lb	$15/calf

In addition to reducing the likelihood of animals contracting waterborne illnesses by providing a clean water supply, streamside fencing excludes livestock from wet, swampy environments as are often found next to streams where cattle have regular access. Keeping cattle in clean, dry areas has been shown to reduce the occurrence of mastitis

and foot rot. The VCE (1998a) reports that mastitis costs producers $100 per cow in reduced quantity and quality of milk produced. On a larger scale, mastitis costs the U.S. dairy industry about $1.7 billion to 2 billion annually or 11% of total U.S. milk production. While the spread of mastitis through a dairy herd can be reduced through proper sanitation of milking equipment, mastitis-causing bacteria can be harbored and spread in the environment where cattle have access to wet and dirty areas. Installation of streamside fencing and well managed loafing areas will reduce the amount of time that cattle have access to these areas.

Taking the opportunity to implement an improved pasture management system in conjunction with installing clean water supplies will also provide economic benefits for the producer. Improved pasture management can allow a producer to feed less hay in winter months, increase stocking rates by 30 to 40 % and, consequently, improve the profitability of the operation. With feed costs typically responsible for 70 to 80 % of the cost of growing or maintaining an animal, and pastures providing feed at a cost of 0.01 to 0.02 cents/lb of total digestible nutrients (TDN) compared to 0.04 to 0.06 cents/lb TDN for hay, increasing the amount of time that cattle are fed on pasture is clearly a financial benefit to producers (VCE, 1996). Standing forage utilized directly by the grazing animal is always less costly and of higher quality than the same forage harvested with equipment and fed to the animal. In addition to reducing costs to producers, intensive pasture management can boost profits by allowing higher stocking rates and increasing the amount of gain per acre. Another benefit is that cattle are closely confined allowing for quicker examination and handling. In general, many of the agricultural BMPs recommended in this document will provide both environmental benefits and economic benefits to the farmer.

6.6.2 Residential Practices

The residential programs will play an important role in improving water quality, since human waste can carry with it human viruses in addition to the bacterial and protozoan pathogens that all fecal matter can potentially carry. In terms of economic benefits to homeowners, an improved understanding of on-site sewage treatment systems, including knowledge of what steps can be taken to keep them functioning properly and the need for

regular maintenance, will give homeowners the tools needed for extending the life of their systems and reducing the overall cost of ownership. The average septic system will last 20 to 25 years if properly maintained. Proper maintenance includes: knowing the location of the system components and protecting them (*e.g.*, not driving or parking on top of them), not planting trees where roots could damage the system, keeping hazardous chemicals out of the system, and pumping out the septic tank every 3 to 5 years. The cost of proper maintenance, as outlined here, is relatively inexpensive ($325) in comparison to repairing or replacing an entire system ($8,000 to $25,000). Additionally, the repair/replacement and pump-out programs will benefit owners of private sewage (*e.g.*, septic) systems, particularly low-income homeowners, by sharing the cost of required maintenance.

In addition to the benefits to individual landowners, the economy of the local community will be stimulated through expenditures made during implementation, and the infusion of dollars from funding sources outside the impaired areas. Building contractors and material suppliers who deal with septic system pump-outs, private sewage system repair and installation, fencing, and other BMP components can expect to see an increase in business during implementation. Additionally, income from maintenance of these systems should continue long after implementation is complete. As will be discussed in greater detail in Chapter 9, a portion of the funding for implementation can be expected to come from state and federal sources. This portion of funding represents money that is new to the area and will stimulate the local economy. In general, implementation will provide not only environmental benefits to the community, but economic benefits as well, which, in turn, will allow for individual landowners to participate in implementation.

6.6.3 Watershed Health and Associated Benefits

Focusing on reducing bacteria in the Hardware River watershed will have associated watershed health benefits as well. Reductions in streambank erosion, excessive nutrient runoff, and water temperature are additional benefits associated with streamside buffer plantings. In turn, reduced nutrient loading and erosion and cooler water temperatures improves habitat for fisheries, which provides associated benefits to anglers and the local economy.

Riparian buffers can also improve habitat for wildlife such as ground-nesting quail and other sensitive species. Data collected from Breeding Bird Surveys in Virginia indicate that the quail population declined 4.2% annually between 1966 and 2007. Habitat loss has been cited as the primary cause of this decline. As a result, Virginia has experienced significant reductions in economic input to rural communities from quail hunting. The direct economic contribution of quail hunters to the Virginia economy was estimated at nearly $26 million in 1991, with the total economic impact approaching $50 million. Between 1991 and 2004, the total loss to the Virginia economy was more than $23 million from declining quail hunter expenditures (VDGIF, 2009). Funding is available to assist landowners in quail habitat restoration (see Chapter 9).

7. MEASUREABLE GOALS AND MILESTONES

Given the scope of work involved with implementing this TMDL, full implementation and de-listing from the Virginia Section 305(b)/303(d) list could be expected within 12 years provided that full funding for technical assistance and BMP cost share were available. Described in this section are a timeline for implementation, water quality and implementation goals and milestones, and strategies for targeting of best management practices.

7.1 Milestone Identification

The end goals of implementation are restored water quality of the impaired waters and subsequent de-listing of the waters from the Commonwealth of Virginia's Section 305(b)/303(d) list within 12 years. Progress toward end goals will be assessed during implementation through tracking of best management practices through the Virginia Agricultural Cost-Share Program and continued water quality monitoring.

Expected progress in implementation is established with two types of milestones: *implementation milestones* and *water quality milestones*. Implementation milestones establish the amount of control measures installed within certain timeframes, while water quality milestones establish the corresponding improvements in water quality that can be expected as the implementation milestones are met. The milestones described here are intended to achieve full implementation within 12 years.

Following the idea of a staged implementation approach, resources and finances will be concentrated on the most cost-efficient control measures and areas of highest interest first. For instance, the TMDL study indicated runoff from pasture contributes approximately 93-95% of the total bacteria load in the watersheds. Concentrating on implementing pasture management practices within the first several years may provide the highest return on water quality improvement with less cost to landowners. Implementation has been divided up into three stages: 2016-2020, 2021-2025, and 2026-2027. The geometric mean water quality standard for E. coli (126 cfu/100mL) is met 100% of the time in Stage 1 for both the NF Hardware River and the Hardware River. In Stage 2, both rivers are expected to meet the single sample maximum criteria (235 cfu/100mL) over 89.5% of the time, meaning that they will be eligible for de-listing at

the point in time. Some additional BMP work is included in Stage 3 for the NF Hardware River to bring the violation rate for the single sample maximum criteria closer to zero. Stage 3 will also serve as an opportunity to evaluate conditions in the Hardware River watershed and identify any additional opportunities for BMP implementation and subsequent water quality improvements. Tables 7.1 - 7.4 show implementation and water quality improvement goals for *E. coli* bacteria for each watershed in each implementation stage.

Table 7.1 Staged implementation goals for North Fork Hardware River

BMP Type	Description	Units	Stage 1		Stage 2		Stage 3	
			Extent	% land use treated	Extent	% land use treated	Extent	% land use treated
Livestock stream exclusion	Livestock exclusion with riparian buffers (100 feet)	feet (systems)	9,039 (3)	24%	0	0%	381 (0.2)	1.25%
	Livestock exclusion with riparian buffers (35 feet)		21,693 (8)	57%	0	0%	913 (0.4)	3%
	Livestock exclusion with reduced setback (10 feet)		5,423 (2)	14%	0	0%	228 (0.1)	0.75%
Pasture	Improved pasture management	acres	912	24%	0	0%	243	30%
	Grazing land management		161	4%	0	0%	43	5%
	Reforestation of erodible pasture		33	0.75%	0	0%	0	0%
	Permanent vegetation on critical areas		11	0.25%	0	0%	0	0%
	Barnyard runoff controls (equine)	Systems	1	0.1%	0	0%	0	0%
	Manure storage/composting (equine)		1	0.1%	0	0%	0	0%
Hayland	Riparian buffers (forested)	Acres	3.6	0.06%	0	0%	0	0%
Cropland	Cover crops	Acres	11	50%	0	0%	0	0%
	Riparian buffers (grass and forest)		1.7	0.4%	0	0%	0	0%
Residential *	Septic tank pumpouts	Pumpouts	91	20%	23	5%	0	0%
	Septic system repair	repairs	18	14%	5	4%	0	0%
	Septic system replacement	systems	29	23%	7	6%	0	0%
	Septic system replacement with pump		18	14%	4	4%	0	0%
	Alternative waste treatment		35	28%	9	7%	0	0%
	Pet waste station	stations	1	<0.01%	0	0%	0	0%
	Riparian buffers (grass and forested)	acres	6.93	0.02%	0	0%	0	0%
Average annual *E. coli* load (cfu/yr)			2.02E+13		1.98E+13		1.26E+13	
% Violation of the Single Sample *E. coli* standard (235 cfu/100mL)			4.9%		4.6%		1.7%	
% Violation rate of the Geometric Mean *E. coli* standard (126 cfu/100mL)			0.0%		0.0%		0.0%	

*For all septic system practices, percent land use treated: percent calculation based on number of failing systems and straight pipes with exception of septic tank pumpouts (based on the total number of dwellings with septic systems)

Table 7.2 Staged implementation goals for Hardware River

BMP Type	Description	Units	Stage 1		Stage 2	
			Extent	% land use treated	Extent	% land use treated
Livestock stream exclusion	Livestock exclusion with riparian buffers (100 feet)	feet (systems)	12,355 (4)	24%	602 (0.5)	1%
	Livestock exclusion with riparian buffers (35 feet)		29,651 (10)	57%	1,445 (0.5)	3%
	Livestock exclusion with reduced setback (10 feet)		7,413 (2)	14%	361 (0.3)	1%
Pasture	Improved pasture management	acres	4,150	24%	2,158	77%
	Grazing land management		732	4%	381	14%
	Reforestation of erodible pasture		206	0.75%	0	0%
	Permanent vegetation on critical areas		41	0.25%	0	0%
	Barnyard runoff controls (equine)	systems	0	0%	1	0.1%
	Manure storage/composting (equine)		0	0%	1	0.1%
Hayland	Riparian buffers (forested)	acres	3.29	0.12%	0	0%
Cropland	Cover crops	acres	40	4%	0	0%
	Riparian buffers (grass and forest)		18	50%	0	0%
Residential *	Septic tank pumpouts	pumpouts	283	20%	71	5%
	Septic system repair	repairs	56	14%	14	4%
	Septic system replacement	systems	87	23%	22	6%
	Septic system replacement with pump		54	14%	13	4%
	Alternative waste treatment		106	28%	26	7%
	Pet waste station	stations	2	<0.01%	0	0%
Average annual *E. coli* load (cfu/yr)			2.63E+14		1.82E+14	
% Violation of the Single Sample *E. coli* standard (235 cfu/100mL)			15.2%		10.5%	
% Violation rate of the Geometric Mean *E. coli* standard (126 cfu/100mL)			2.8%		0.0%	

*For all septic system practices, percent land use treated: percent calculation based on number of failing systems and straight pipes with exception of septic tank pumpouts (based on the total number of dwellings with septic systems)

7.2 Water Quality Monitoring

Improvements in water quality will be evaluated through water quality monitoring conducted at VADEQ monitoring stations located in the watersheds as shown below in Figure 7.1. Descriptions of these stations are provided in Table 7.3. The map shows stations that are part of VADEQ's Ambient Monitoring Program, wherein bi-monthly watershed monitoring takes place on a rotating basis for two consecutive years of a six-year assessment cycle. Station 1 in the Lower Hardware River is a DEQ trend station. These stations are part of a regular monitoring cycle and are not typically rotated on an off of the monitoring schedule. In cases where the monitoring station is a trend station (Station 1 in Figure 7.1), monitoring will continue as usual. For the other ambient monitoring stations, monitoring will begin no sooner than the second odd numbered calendar year following the initiation of TMDL implementation. Beginning implementation monitoring after 2 to 3 years of TMDL implementation will help ensure that time has passed for remedial measures to have stabilized and BMPs to have become functional. At a minimum, the frequency of sample collections will be every other month for two years. After two years of bi-monthly monitoring an assessment will be made to determine if the segments are no longer impaired. If full restoration, as defined in the current or most recent version of the DEQ Final Water Quality Assessment Guidance Manual, has been achieved, monitoring will be suspended. If the two listing stations shown on the map, or any other stations associated with this implementation plan have three or more exceedances of the bacteria standard within this two year period, monitoring will be discontinued for two years. Bi-monthly monitoring will be resumed for another two years on the odd numbered calendar year in the third two-year period of the six year assessment window. After this, the most recent two years of data will be evaluated, and the same criteria as was used for the first two year monitoring cycle will apply.

Intensive, one-year monthly sampling may occur within any single calendar year. It is generally preferred to conduct sampling over a two year period to help minimize the effect of fluctuating climate conditions related to dry and wet events.

There is the potential for additional monitoring at a subset of stations in the watersheds where continual VADEQ monitoring is conducted on a bi-monthly basis beginning on the next odd number calendar year after the initiation of implementation. This will require an additional funding

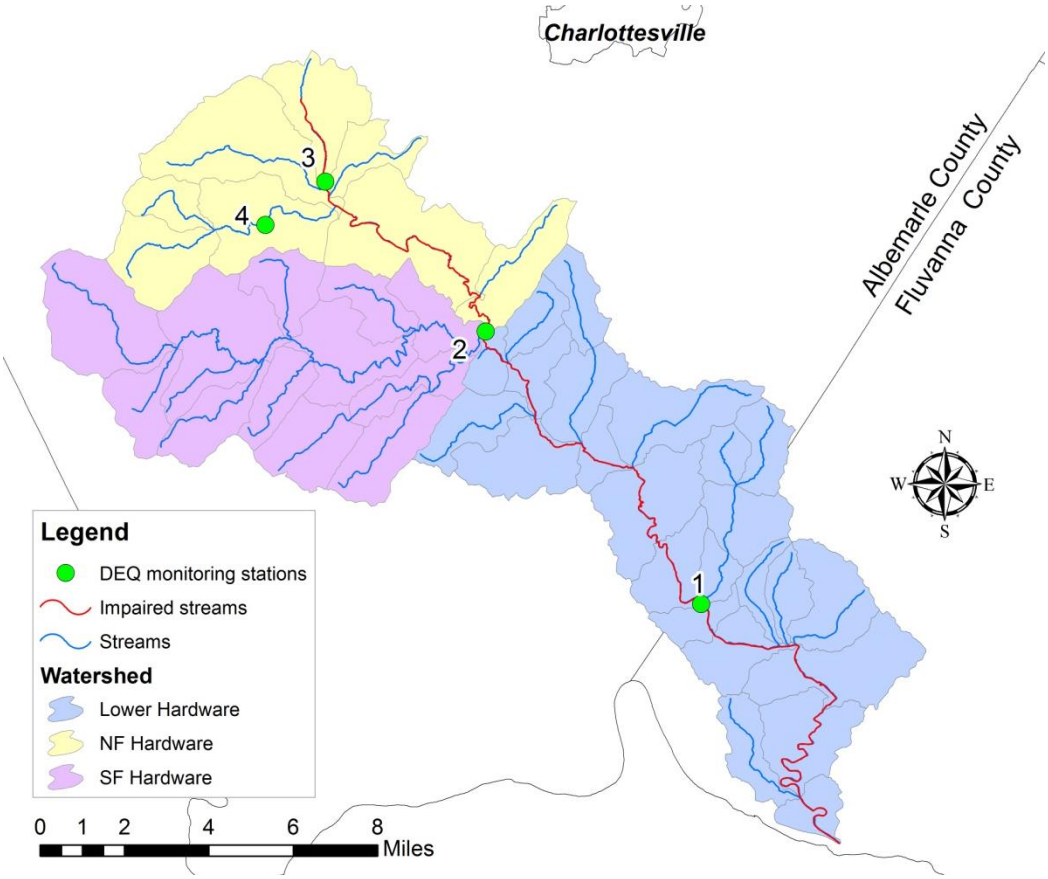

Figure 7.1 DEQ monitoring stations for *E. coli* during TMDL implementation

Table 7.3 DEQ monitoring station descriptions

Station #	DEQ ID #	Stream	River mile	Description
1	2-HRD011.57	Hardware	11.57	Route 637 Bridge at gauging station
2	2-HNF000.10	NF Hardware	0.10	Route 708 Bridge
3	2-HNF008.28	NF Hardware	8.28	Route 708 Bridge
4	2-HNS002.40	South Branch of NF Hardware	2.40	Route 712 Bridge

source and can only be accomplished with sufficient resources to support needs of the data users, and only if watershed conditions and stakeholder support are suitable to this strategy. These monitoring stations will be located in the watersheds based on TMDL implementation funds, either state, federal, or other sources, becoming available.

Citizen monitoring is another very useful tool for measuring improvements in water quality. The TJSWCD launched an extensive Coliscan monitoring program to detect *E.coli* in the watershed in July 2009. Samples were collected on a monthly basis at twelve sites in the watershed through

August 2012. These stations could potentially be re-visited through a citizen monitoring initiative to evaluate water quality improvements following additional BMP implementation in the watersheds.

7.3 Targeting

Implicit in the process of a staged implementation is targeting of best management practices. Targeting ensures optimum utilization of limited technical and financial resources. The agricultural working group discussed potential targeting strategies of fencing practices and other agricultural BMPs. The group discussed the best ways to identify and correct problem areas in the watershed that may be contributing a large amount of pollution to the streams. Citizen monitoring was identified as a good way to identify these areas. Citizen monitoring sample sites should be located in areas of the river where watershed residents have access and typically swim. These areas should be targeted for outreach in the event that monitoring shows high levels of *E. coli*. Based on DEQ water quality monitoring conducted near the mouth of the Hardware River (river mile 0.36), *E.coli* concentrations in the lower portion of the river rarely exceed the single sample maximum criteria of 235 cfu/100ml (<10% of the time). This portion of the watershed is largely forested and includes a state Wildlife Management Area. Consequently, it will be more beneficial with respect to water quality improvements to focus implementation efforts further upstream. In addition, the South Fork of the Hardware River has not been designated as impaired. Therefore, efforts could be focused in the North Fork Hardware River watershed and the upper portion of the Hardware River watershed in order to maximize water quality improvements.

7.3.2 Fencing Prioritization by Subwatershed

Excluding livestock from streams can be very resource intensive with varying results with respect to water quality. This makes targeting of outreach and financial resources very important when addressing livestock access to streams. In 2009, the Thomas Jefferson SWCD conducted a stream assessment of the Hardware River in order to identify properties to target with outreach regarding livestock exclusion practices. Through this effort, and through additional analyses conducted during the development of this plan, approximately 30 properties have been identified where livestock have access to the stream. Tax parcel data was used to identify property owners and develop a mailing list for outreach regarding technical and financial assistance available for

livestock stream exclusion. In addition, segments of the river were further prioritized for livestock exclusion fencing based on potential water quality improvements resulting from stream fencing. Each watershed was divided up into a series of smaller subwatersheds, and an analysis was performed for each subwatershed based on 1) the extent of pasture next to the stream 2) the number of livestock in the watershed, and 3) the proximity of the subwatershed to the headwaters. The subwatersheds were the ranked in ascending order based on the ratio of fence length to bacteria loading (constituted 70% of ranking), and the proximity to the headwaters (constituted 30% of ranking) (Figure 7.2). This additional prioritization may prove useful should the demand for technical and financial assistance with livestock exclusion in the watersheds exceed the capacity of local conservation partners to assist landowners.

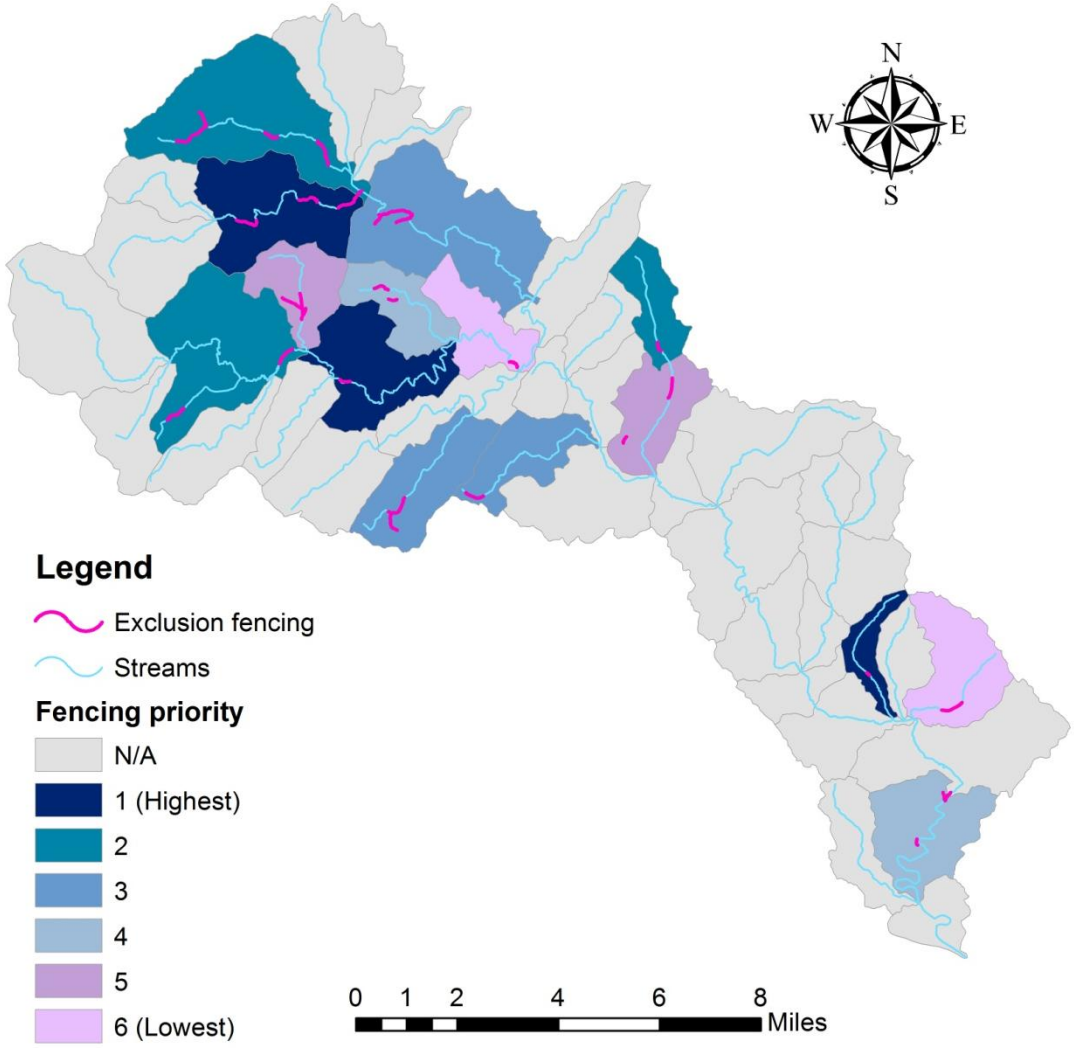

Figure 7.2 Fencing prioritization by subwatershed: Hardware River and NF Hardware River

7.3.2 Septic System Maintenance Prioritization by Subwatershed

Outreach to encourage landowners to properly maintain their septic system is frequently conducted through mailings to homeowners including postcards and brochures. Experience in surrounding counties has shown that often times, landowners must be contacted 2-4 times before they follow up on opportunities for technical and financial assistance with septic system maintenance. This can prove costly when conducting mailings in large watershed including the Hardware River, where there are approximately 1,900 households. Identifying areas in the watershed with older homes and aging septic systems to target with outreach materials can be helpful in maximizing response rates from homeowners and corrections of failing septic systems.

In order to prioritize subwatersheds for septic system maintenance outreach, subwatersheds were ranked based on the estimated percentage of failing septic systems and straight pipes (Figure 4). This information was taken from the Hardware River TMDL study, which used the age of homes to predict septic system failure rates. The rankings shown in Figure 7.3 could be used for follow up outreach after a large watershed mailing if funds were not available for repeated watershed-wide mailings.

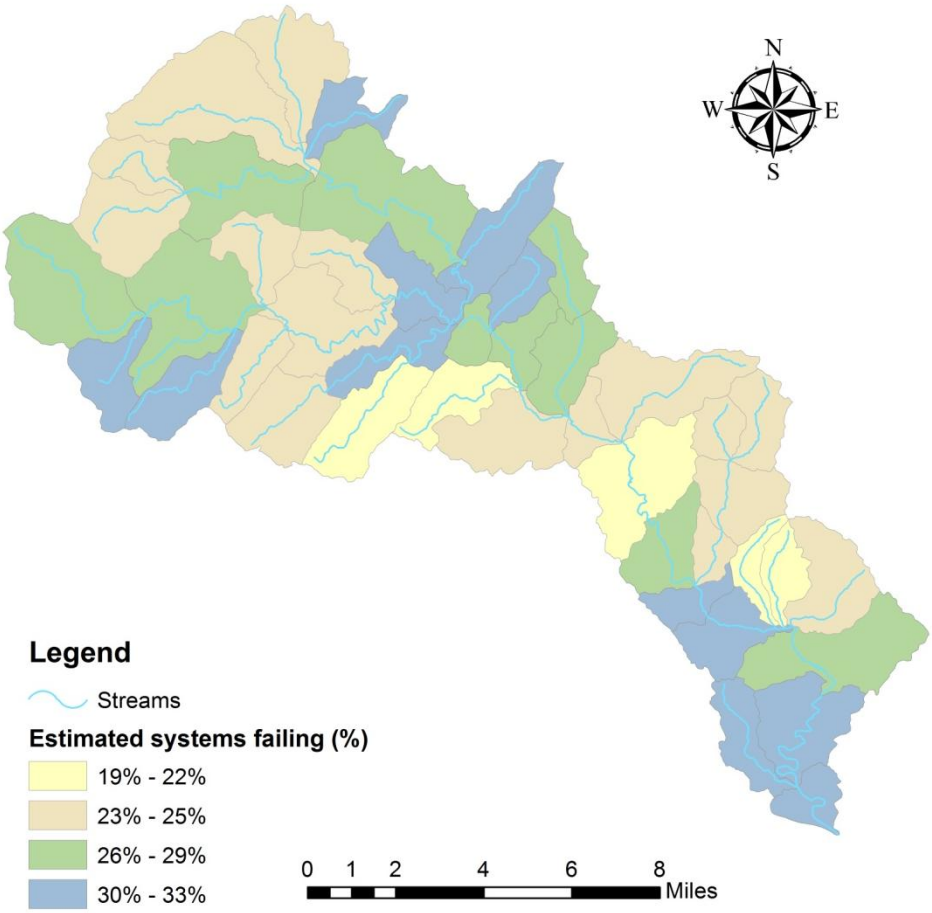

Figure 7.2 Fencing prioritization by subwatershed: Hardware River and NF Hardware River

8. STAKEHOLDERS AND THEIR ROLE IN IMPLEMENTATION

Achieving the goals of this plan is dependent on stakeholder participation and strong leadership on the part of both community members and conservation organizations. The Thomas Jefferson Soil and Water Conservation District's region includes both Albemarle and Fluvanna Counties. The District is responsible for administration of the VA Agricultural BMP Cost Share Program and has staff available to work with agricultural landowners interested in installing BMPs throughout their four county area. The Natural Resource Conservation Service also has staff working to administer federal agricultural cost share programs within the watershed. However, additional partners will be necessary in order to meet the goals included in this plan within the identified 12-year project timeline. In order to address residential implementation needs, partnerships with the Albemarle and Fluvanna County Health Departments will be critical. The following sections in this chapter describe the responsibilities and expectations for the various components of implementation.

8.1 Partner Roles and Responsibilities

8.1.1 Watershed Landowners

The majority of practices recommended in this plan are related to agriculture since it is a predominant land use in the watersheds. Participation from local farmers is thus a key factor to the success of this plan. Consequently, it is important to consider characteristics of farms and farmers in the watersheds that will affect the decisions farmers make when it comes to implementing conservation practices on their farms. For example, the average size of farms is an important factor to consider, since it affects how much land a farmer can give up for a riparian buffer. The age of a farmer, which was 58 in Virginia in 2012, may also influence their decision to implement best management practices, particularly if they are close to retirement and will be relying on the sale of their land for income during retirement. In such cases, it may be less likely that a farmer would be willing to invest a portion of their income in best management practices. Table 8.1 provides a summary of relevant characteristics of farmers and producers in Albemarle and Fluvanna Counties from the 2012 Agricultural Census. These characteristics were considered when developing implementation scenarios, and should be utilized to develop suitable education and outreach strategies.

Table 8.1 Characteristics of farms and farmers in Albemarle and Fluvanna Counties

Characteristic	Albemarle	Fluvanna
Number of farms	946	303
Land in farms (acres)	168,877	47,077
Proportion of land area in farms (%)	36.1	25.7
Owned land in farms (acres)	34,514	8,223
Rented land in farms (acres)	36,394	9,987
Full owners of farms	686	226
Part owners of farms	208	64
Tenants	52	13
Operators identifying farming as their primary occupation	392	131
Operators identifying something other than farming as their primary occupation	554	172
Average age of primary operator	62	60
Average size of farm (acres)	179	155
Average market value of land and buildings ($/acre)	$8,756	$5,097
Average net cash farm income of operation ($)	-$11,043	-$3,214
Average farm production expenses ($)	$50,230	$23,344
Farms with internet access	702	231

In addition to local farmers, participation from homeowners, local government staff, and elected officials is critical to the success of this plan. Elected officials make important decisions with respect to land use and development that are likely to affect water quality. Residential property owners will need to ensure that their septic systems are regularly pumped and inspected (every 3-5 years). Though the amount of bacteria coming from failing septic systems and straight pipes is minimal compare to livestock, human waste carries with it pathogens that can cause considerable health problems.

8.1.2 Thomas Jefferson Soil and Water Conservation District and Natural Resource Conservation Service

Both the SWCD and NRCS are continually reaching out to farmers in the watersheds and providing them with technical and financial assistance with conservation practices. Their responsibilities include promoting available funding and the benefits of BMPs and providing assistance in the survey, design, and layout of agricultural BMPs. The SWCD and NRCS staff will conduct outreach activities in the watershed to encourage participation in conservation

programs. Such activities include mailing out newsletters and organizing field days. The SWCD's will work cooperatively in their efforts to increase local awareness of water quality issues in the creeks and make agricultural landowners aware of financial and technical assistance available for BMP implementation in the watersheds. Should funding for additional staff to implement the agricultural component of this plan become available, the SWCDs will work together to ensure adequate coverage of the project area across their coverage boundaries.

Dedicated staff is currently not available to lead efforts to correct failing septic systems and straight pipes. Watershed groups such as the Middle James Roundtable could work with the Albemarle and Fluvanna County Health Departments to implement such a program using grant funds. In addition, the Thomas Jefferson SWCD has considerable experience implementing residential septic programs including two projects in the nearby Rockfish and Tye River watersheds. Since they have trained and experienced staff, they could take the lead in administering a residential cost share program as well should funding become available.

8.1.3 Albemarle and Fluvanna Counties

Decisions made by local governments regarding land use and zoning will play an important role in the implementation of this plan. This makes the Albemarle and Fluvanna County Boards of Supervisors and Planning Commissions key partners in long term implementation efforts. Currently, both counties have zoning and land use policies in place that support the preservation of agricultural land and encourage good stewardship of natural resources. Both counties administer conservation easement programs, which have helped to encourage land conservation across the counties. Based on feedback from the agricultural working group, suburban encroachment is a significant issue in the watershed, with the number of working farms in the area significantly declining over the last 20 years. Local government support of this type of land conservation will become increasingly important as greater numbers of conservation measures are implemented across the watersheds. Ensuring that land remains in agriculture and forest will allow the practices installed to continue to benefit water quality. In addition, protective ordinances such as Albemarle County's Water Protection Ordinance will help to protect water quality. The ordinance requires that vegetated buffers be preserved or established along most County streams and limits activities that can occur within those areas including building and grading.

8.1.4 Virginia Department of Environmental Quality

The Virginia Department of Environmental Quality (DEQ) has a lead role in the development of TMDL-IPs to address non-point source pollutants such as bacteria from straight pipes, failing septic systems, pet waste, agricultural operations, and stormwater that contribute to water quality impairments. DEQ provides available grant funding and technical support for the implementation of NPS (non-point source) components of TMDL-IPs. DEQ will work closely with project partners including the Thomas Jefferson Soil and Water Conservation District to track implementation progress for best management practices. In addition, DEQ will work with interested partners on grant proposals to generate funds for projects included in the implementation plan. When needed, DEQ will facilitate additional meetings of the steering committee to discuss implementation progress and make necessary adjustments to the implementation plan.

DEQ is also responsible for monitoring state waters to determine compliance with water quality standards. DEQ will continue monitoring water quality in the Hardware River and its tributaries in order to assess water quality and determine when restoration has been achieved and the streams can be removed from Virginia's impaired waters list.

8.1.5 Virginia Department of Conservation and Recreation

The Virginia Department of Conservation and Recreation (DCR) administers the Virginia Agricultural Cost Share Program, working closely with Soil and Water Conservation Districts to provide cost share and operating grants needed to deliver this program at the local level. DCR works with the SWCDs to track BMP implementation as well. In addition, DCR administers the state's Nutrient Management Program, which provides guidelines and technical assistance to producers in appropriate manure and poultry litter storage and application, as well as application of commercial fertilizer.

8.1.6 Other Potential Local Partners

There are numerous opportunities for future partnerships in the implementation of this plan and associated water quality monitoring. A list of additional organizations and entities with which partnership opportunities should be explored is provided below:

- VA Cooperative Extension
- Fluvanna and Albemarle County Farm Bureaus
- Friends of the Hardware River
- Southeastern Rural Community Assistance Program
- Master Well Owner Network (VCE)

- Chesapeake Bay Funders Network
- Trout Unlimited
- VA Master Gardeners (Piedmont and Fluvanna Chapters)
- Fluvanna and Rivanna Chapters of VA Master Naturalists
- Chesapeake Conservancy
- Nature Conservancy
- Middle James Roundtable
- VA Department of Forestry
- James River Association
- Chesapeake Bay Foundation
- Habitat for Humanity

8.2 Integration with Other Watershed Plans

Each watershed in the state is under the jurisdiction of a multitude of individual yet related water quality programs and activities, many of which have specific geographic boundaries and goals. These include but are not limited to TMDLs, Roundtables, Water Quality Management Plans, erosion and sediment control regulations, stormwater management, source water protection Programs, and local comprehensive plans. Coordination of the implementation project with these existing programs could result in additional resources and increased participation.

8.2.1 Albemarle and Fluvanna County Comprehensive Plans

Both Albemarle and Fluvanna Counties have Comprehensive Plans that are intended to guide development and natural resource management within their jurisdictions. Both plans stress the importance of the preservation of rural areas, and encourage development in development core areas. Green infrastructure concepts are featured throughout both plans, which will work to protect water quality from future development impacts. In addition, both plans encourage the development of recreational opportunities for the local community that will increase awareness of the value of water resources including blueways and greenways (Albemarle County, 2015; Fluvanna County, 2015). Increasing local awareness and appreciation of the Hardware River and its tributaries will in turn increase local support for the implementation of conservation practices designed to improve water quality.

8.2.2 Albemarle & Fluvanna County Conservation Easement & Ag Forestal District Programs

Both Albemarle and Fluvanna Counties have developed programs and policies to support the preservation of agricultural and forested lands within their jurisdictions by providing tax incentives to landowners. Conservation easement programs allow the counties to co-hold easements that protect agricultural and forested lands in perpetuity. In addition, both counties offer programs that allow landowners to establish Ag Forestal Districts. These rural conservation areas are protected from development for a limited period of time and in return, landowners can take advantage of property tax incentives. The preservation of agricultural land in the Hardware River watershed will help to extend the life span of agricultural BMPs installed by landowners, while protection of forest land will provide numerous water quality benefits including the filtration of pollutants from adjacent developed lands.

8.2.3 Albemarle County Water Resource Management Program

Albemarle County's Water Resource Management Program includes a number of initiatives designed to protect the County's water resources. The Water Protection Ordinance (Albemarle County, Virginia, Municipal Code §17-100-403) requires that vegetated buffers be preserved or established along most County streams and limits activities that can occur within those areas including building, grading and other development activities. Generally, the ordinance requires a 100 foot buffer along streams, ponds and wetlands. Agricultural activities such as grazing are exempt from this requirement. In addition, the County is a member of the Rivanna Stormwater Education Partnership, which has developed numerous educational materials encouraging landowners to implement BMPs and pick up after their pets. The County has an "A-Mail list" for Natural Resources that the community can sign up for in order to receive regular updates on natural resource management in the region. This is an effective tool in keeping the public informed about local water quality issues and how they can get involved. Albemarle County has also established a Water Resources Funding Advisory Committee that has met monthly since September 2014. The primary objective of this committee is to identify funding mechanisms to support the County's Water Resources Program. The ordinances, education and outreach, and funding programs in place in the County may all serve as important tools in moving the implementation of this plan forward, and should be integrated into implementation efforts in the future.

8.2.4 VA Dept. of Game and Inland Fisheries Hardware River Wildlife Management Area

The Hardware River Wildlife Management Area is one of 40 management areas maintained by the Department of Game and Inland Fisheries across the state. These lands are purchased and maintained with hunting, fishing and trapping license fees along with Federal Assistance in Wildlife Restoration funds, which comes from the sale of hunting-related equipment. These lands are held in trust by DGIF to conserve habitat for wildlife. The goal of establishing and maintaining these areas is to "maintain and enhance habitats that support game and nongame wildlife while providing opportunities to hunt, fish, trap and view wildlife" (DGIF, 2015). The Hardware River Wildlife Management Area is located along the mainstem of the river just above the watershed outlet and includes 1,034 acres of primarily forested land. The management goals established by DGIF for the area dovetail with the water quality and land use management goals established in this plan.

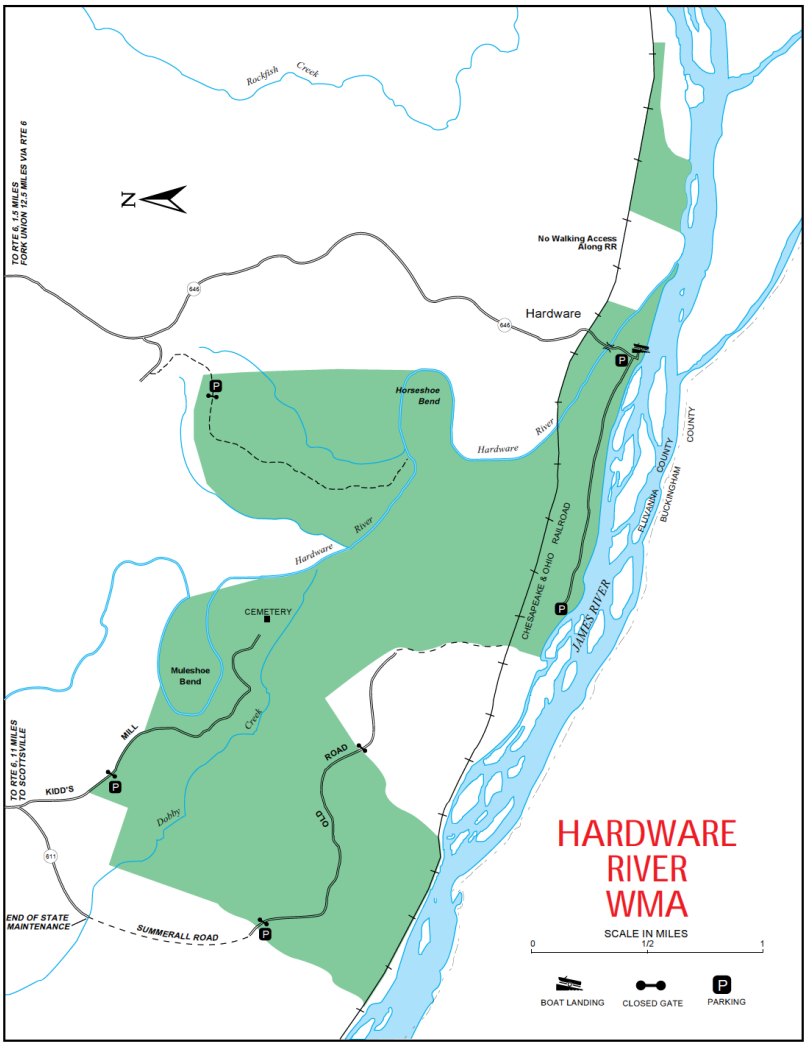

Figure 8.1 Hardware River Wildlife Management Area (*Map*: DGIF [Internet]. Available from http://www.dgif.virginia.gov/wmas/maps/hardwareriver.pdf)

8.2.5 Virginia's Phase II Chesapeake Bay Watershed Implementation Plan

Virginia's Watershed Implementation Plan (WIP) outlines a series of BMPs, programs and regulations that will be implemented across the state in order to meet nitrogen, phosphorous and sediment loading reductions called for in the Chesapeake Bay TMDL, completed in December 2010. The TMDL is designed to ensure that all pollution control measures needed to fully restore the Bay are in place by 2025, with at least 60% of the actions completed by 2017. A number of the BMPs included in this implementation plan are also found in Virginia's WIP. Consequently, Albemarle and Fluvanna Counties will be able to track and receive credit for program in meeting Phase II WIP goals while also working towards implementation goals established in this plan to improve local water quality. For more information about Virginia's Phase II WIP, please visit DEQ's webpage: http://www.deq.virginia.gov/Programs/Water/ChesapeakeBay.aspx.

8.2.5 Additional Natural Resource Management and Conservation Planning

There are a number of organizations working to implement natural resource management and land conservation plans in the watersheds. The Virginia Department of Game and Inland Fisheries is currently working to implement the "Northern Bobwhite Quail Action Plan for Virginia," which includes a series of recommended management practices that will also help to improve water quality by reducing runoff and filtering out pollutants before they reach the stream (VADGIF, 2009). Trout Unlimited has a "Trout in the Classroom" program to engage local schools and students in learning about the importance of clean water and high quality aquatic habitat to support trout and other aquatic species. This type of outreach and education will also support the water quality improvement goals included in this plan. In addition, a number of organizations including the Virginia Outdoors Foundation, the Nature Conservancy, and the Thomas Jefferson SWCD are working with landowners and local governments to preserve agricultural land in Virginia through conservation easements. These easements can include some form of riparian buffer protection, and also help to ensure the longevity of efforts made to implement conservation practices on agricultural land. Whenever possible, efforts should be made to integrate the implementation of these and other conservation-related plans that will impact water quality with this plan for the Hardware River and its tributaries.

8.3 Legal Authority

The EPA has the responsibility of overseeing the various programs necessary for the success of the CWA. However, administration and enforcement of such programs falls largely to the states. In the Commonwealth of Virginia, water quality problems are dealt with through legislation, incentive programs, education, and legal actions. Currently, there are four state agencies responsible for regulating activities that impact water quality in Virginia. These agencies are DEQ, DCR, VDH, and Virginia Department of Agriculture and Consumer Services (VDACS).

DEQ has responsibility for monitoring waters to determine compliance with state standards, and for requiring permitted point dischargers to maintain loads within permit limits. It has the regulatory authority to levy fines and take legal action against those in violation of permits. Beginning in 1994, animal waste from confined animal facilities that hold in excess of 300 animal units (cattle and hogs) has been managed through a Virginia general pollution abatement permit. These operations are required to implement a number of practices to prevent surface and groundwater contamination. In response to increasing demand from the public to develop new regulations dealing with animal waste, the Virginia General Assembly passed legislation in 1999 requiring DEQ to develop regulations for the management of poultry waste in operations having more than 200 animal units of poultry (about 20,000 chickens) (ELI, 1999). On January 1, 2008 DEQ assumed regulatory oversight of all land application of treated sewage sludge, commonly referred to as biosolids as a directed by the Virginia General Assembly in 2007. DEQ's Office of Land Application Programs within the Water Quality Division to manages the biosolids program. The biosolids program includes having and following nutrient management plans for all fields receiving biosolids, unannounced inspections of the land application sites, certification of persons land applying biosolids, and payment of a $7.50 fee per dry ton of biosolids land applied. DEQ holds the responsibility for addressing nonpoint sources (NPS) of pollution as of July 1, 2013.

DCR is responsible for administering the Virginia Agricultural Cost Share and Nutrient Management Programs. Historically, most DCR programs have dealt with agricultural NPS pollution through education and voluntary incentives. These cost-share programs were originally developed to meet the needs of voluntary partial participation and not the level of participation required by TMDLs (near 100%). To meet the needs of the TMDL program and achieve the goals

set forth in the CWA, the incentive programs are continually reevaluated to account for this level of participation.

Through Virginia's Agricultural Stewardship Act (ASA), the Commissioner of Agriculture has the authority to investigate claims that an agricultural producer is causing a water quality problem on a case-by-case basis (Pugh, 2001). If deemed a problem, the Commissioner can order the producer to submit an agricultural stewardship plan to the local soil and water conservation district. If a producer fails to implement the plan, corrective action can be taken which can include a civil penalty of up to $5,000 per day. The Commissioner of Agriculture can issue an emergency corrective action if runoff is likely to endanger public health, animals, fish and aquatic life, public water supply, etc. An emergency order can shut down all or part of an agricultural activity and require specific stewardship measures. VDACS has three staff members dedicated to enforcing the Agricultural Stewardship Act, and a small amount of funding is available to support water quality sampling. The Agricultural Stewardship Act is entirely complaint-driven.

VDH is responsible for maintaining safe drinking water measured by standards set by the EPA. Their duties also include septic system regulation and, historically, regulation of biosolids land application on permitted farmland sites. Like VDACS, VDH's actions are complaint-driven. Complaints can range from a vent pipe odor that is not an actual sewage violation and takes very little time to investigate, to a large discharge violation that may take many weeks or longer to effect compliance. In relation to these TMDLs, VDH has the responsibility of enforcing actions to correct or eliminate failed septic systems and straight pipes.

State government has the authority to establish state laws that control delivery of pollutants to local waters. Local governments, in conjunction with the state, can develop ordinances involving pollution prevention measures. In addition, citizens have the right to bring litigation against persons or groups of people shown to be causing some harm to the claimant. The judicial branch of government also plays a significant role in the regulation of activities that impact water quality through hearing the claims of citizens in civil court and the claims of government representatives in criminal court.

8.4 Legal Action

The Clean Water Act Section 303(d) calls for the identification of impaired waters. It also requires that the streams be ranked by the severity of the impairment and that TMDLs be calculated for streams to meet water quality standards. TMDL implementation plans are not required in the Federal Code; however, Virginia State Code does include the development of implementation plans for impaired streams. EPA largely ignored the nonpoint source section of the Clean Water Act until citizens began to realize that regulating only point sources was no longer maintaining water quality standards. Lawsuits from citizens and environmental groups citing EPA for not carrying out the statutes of the CWA began as far back as the 1970s and have continued until the present. In Virginia in 1998, the American Canoe Association and the American Littoral Society filed a complaint against EPA for failure to comply with provisions of §303d. The suit was settled by Consent Decree, which contained a TMDL development schedule through 2010. It is becoming more common for concerned citizens and environmental groups to turn to the courts for the enforcement of water quality issues.

Successful implementation depends on stakeholders taking responsibility for their role in the process. The primary role, of course, falls on the landowner. However, local, state and federal agencies also have a stake in ensuring that Virginia's waters are clean and provide a healthy environment for its citizens. An important first step in correcting the existing water quality problem is recognizing that there is a problem and that the health of citizens is at stake. Virginia's approach to correcting NPS pollution problems has been, and continues to be, encouragement of participation through education and financial incentives.

9. FUNDING

A list of potential funding sources available for implementation has been developed. A brief description of the programs and their requirements is provided in this chapter. Detailed descriptions can be obtained from the SWCD, DEQ, DCR, NRCS, and VCE.

9.1 Virginia Agricultural Best Management Practices Cost-Share Program

The cost-share program is funded with state and federal monies through local SWCDs. SWCDs administer the program to encourage farmers and landowners to use BMPs on their land to better control transportation of pollutants into our waters due to excessive surface flow, erosion, leaching, and inadequate animal waste management. Program participants are recruited by SWCDs based upon those factors, which have a great impact on water quality. Cost-share is typically 75% of the actual cost, not to exceed the local maximum.

9.2 Virginia Agricultural Best Management Practices Tax Credit Program

For all taxable years, any individual or corporation engaged in agricultural production for market, who has in place a soil conservation plan approved by the local SWCD, is allowed a credit against the tax imposed by Section 58.1-320 of an amount equaling 25% of the first $70,000 expended for agricultural best management practices by the individual. Any practice approved by the local SWCD Board must be completed within the taxable year in which the credit is claimed. The credit is only allowed for expenditures made by the taxpayer from funds of his/her own sources. The amount of the credit cannot exceed $17,500 or the total amount of the tax imposed by this program (whichever is less) in the year the project was completed. If the amount of the credit exceeds the taxpayer's liability for such taxable year, the excess may be carried over for credit against income taxes in the next five taxable years until the total amount of the tax credit has been taken. This program can be used independently or in conjunction with other cost-share programs on the stakeholder's portion of BMP costs. It is also approved for use in supplementing the cost of repairs to streamside fencing.

9.3 Virginia Agricultural Best Management Practices Loan Program

Loan requests are accepted through VADEQ. The interest rate is 3% per year and the term of the loan coincides with the life span of the practice. To be eligible for the loan, the BMP must be included in a conservation plan approved by the local SWCD Board. The minimum loan amount is $5,000; there is no maximum limit. Eligible BMPs include 23 structural practices such as animal waste control facilities, loafing lot management systems, and grazing land protection systems. The loans are administered through participating lending institutions.

9.4 Virginia Small Business Environmental Assistance Fund Loan Program

The Fund, administered through VADEQ, is used to make loans or to guarantee loans to small businesses for the purchase and installation of environmental pollution control equipment, equipment to implement voluntary pollution prevention measures, or equipment and structures to implement agricultural BMPs. The equipment must be needed by the small business to comply with the federal Clean Air Act, or it will allow the small business to implement voluntary pollution prevention measures. The loans are available in amounts up to $50,000 and will carry an interest rate of 3%, with favorable repayment terms based on the borrower's ability to repay and the useful life of the equipment being purchased or the life of the BMP being implemented. There is a $30 non-refundable application processing fee. The Fund will not be used to make loans to small businesses for the purchase and installation of equipment needed to comply with an enforcement action. To be eligible for assistance, a business must employ 100 or fewer people and be classified as a small business under the federal Small Business Act.

9.5 Virginia Water Quality Improvement Fund

This is a permanent, non-reverting fund established by the Commonwealth of Virginia in order to assist local stakeholders in reducing point and nonpoint nutrient loads to surface waters. Eligible recipients include local governments, SWCDs, and individuals. Grants for both point and non point source pollution remediation are administered through VADEQ. Most WQIF grants provide matching funds on a 50/50 cost-share basis.

9.6 Conservation Reserve Program (CRP)

Through this program, cost-share assistance is available to establish cover of trees or herbaceous vegetation on cropland. Offers for the program are ranked, accepted and processed during fixed signup periods that are announced by FSA. If accepted, contracts are developed for a minimum of 10 and not more than 15 years. Payments are based on a per-acre soil rental rate. To be eligible for consideration, the following criteria must be met: 1) cropland was planted or considered planted in an agricultural commodity for two of the five most recent crop years, and 2) cropland is classified as "highly-erodible" by NRCS. Application evaluation points can be increased if certain tree species, spacing, and seeding mixtures that maximize wildlife habitats are selected. Land must have been owned or operated by the applicant for at least 12 months prior to the close of the signup period. The payment to the participant is up to 50% of the cost for establishing ground cover. Incentive payments for wetlands hydrology restoration equal 25% of the cost of restoration.

9.7 Conservation Reserve Enhancement Program (CREP)

This program is an "enhancement" of the existing USDA CRP Continuous Sign-up. It has been "enhanced" by increasing the cost-share rates from 50% to 75% and 100%, increasing the rental rates, and offering a flat rate incentive payment to place a permanent "riparian easement" on the enrolled area. Pasture and cropland (as defined by USDA) adjacent to streams, intermittent streams, seeps, springs, ponds and sinkholes are eligible to be enrolled. Buffers consisting of native, warm-season grasses on cropland, to mixed hardwood trees on pasture, must be established in widths ranging from the minimum of 30% of the floodplain or 35 feet, whichever is greater, to a maximum average of 300 feet. Cost-sharing (75% - 100%) is available to help pay for fencing to exclude livestock from the riparian buffer, watering facilities, hardwood tree planting, filter strip establishment, and wetland restoration. In addition, a 40% incentive payment upon completion is offered and an average rental rate of $70/acre on stream buffer area for 10-15 years. The State of Virginia will make an additional incentive payment to place a perpetual conservation easement on the enrolled area.

The landowner can obtain and complete CREP application forms at the FSA center. The forms are forwarded to local NRCS and SWCD offices while FSA determines land

eligibility. If the land is deemed eligible, NRCS and the local SWCD determine and design appropriate conservation practices. A conservation plan is written, and fieldwork is begun, which completes the conservation practice design phase.

FSA then measures CREP acreage, conservation practice contracts are written, and practices are installed. The landowner submits bills for cost-share reimbursement to FSA. Once the landowner completes BMP installation and the practice is approved, FSA and the SWCD make the cost-share payments. The SWCD also pays out the state's one-time, lump sum rental payment. FSA conducts random spot checks throughout the life of the contract, and the agency continues to pay annual rent throughout the contract period.

9.8 Environmental Quality Incentives Program (EQIP)

This program was established in the 1996 Farm Bill to provide a single voluntary conservation program for farmers and landowners to address significant natural resource needs and objectives. Approximately 65% of the EQIP funding for the state of Virginia is directed toward "Priority Areas." These areas are selected from proposals submitted by a locally led conservation work group. Proposals describe serious and critical environmental needs and concerns of an area or watershed, and the corrective actions they desire to take to address these needs and concerns. The remaining 35% of the funds are directed toward statewide priority concerns of environmental needs. EQIP offers 5 to 10-year contracts to landowners and farmers to provide 75% cost-share assistance, 25% tax credit, and/or incentive payments to implement conservation practices and address the priority concerns statewide or in the priority area. Eligibility is limited to persons who are engaged in livestock or agricultural production. Eligible land includes cropland, pasture, and other agricultural land in priority areas, or land that has an environmental need that matches one of the statewide concerns.

9.9 Wildlife Habitat Incentive Program (WHIP)

WHIP is a voluntary program for landowners who want to develop or improve wildlife habitat on private agricultural lands. Participants work with NRCS to prepare a wildlife habitat development plan. This plan describes the landowner's goals for improving wildlife habitat and includes a list of practices and a schedule for installation. A 10-year contract provides cost-share and technical assistance to carry out the plan. In Virginia,

these plans are prepared to address one or more of the following high priority habitat needs: early grassland habitats that are home to game species such as quail and rabbit as well as other non-game species like meadowlark and sparrows; riparian zones along streams and rivers that provide benefits to aquatic life and terrestrial species; migration corridors which provide nesting and cover habitats for migrating songbirds, waterfowl and shorebird species; and decreasing natural habitat systems which are environmentally sensitive and have been impacted and reduced through human activities. Cost-share assistance of up to 75% of the total cost of installation (not to exceed $10,000 per applicant) is available for establishing habitat. Types of practices include: disking, prescribed burning, mowing, planting habitat, converting fescue to warm season grasses, establishing riparian buffers, creating habitat for waterfowl, and installing filter strips, field borders and hedgerows. For cost-share assistance, USDA pays up to 75% of the cost of installing wildlife practices.

9.10 Wetland Reserve Program (WRP)

This program is a voluntary program to restore and protect wetlands on private property. The program benefits include providing fish and wildlife habitat, improving water quality, reducing flooding, recharging groundwater, protecting and improving biological diversity, and furnishing recreational and esthetic benefits. Sign-up is on a continuous basis. Landowners who choose to participate in WRP may receive payments for a conservation easement or cost-share assistance for a wetland restoration agreement. The landowner will retain ownership but voluntarily limits future use of the land. The program offers landowners three options: permanent easements, 30-year easements, and restoration cost-share agreements of a minimum 10-year duration. Under the permanent easement option, landowners may receive the agricultural value of the land up to a maximum cap and 100% of the cost of restoring the land. For the 30-year option, a landowner will receive 75% of the easement value and 75% cost-share on the restoration. A ten-year agreement is also available that pays 75% of the restoration cost. To be eligible for WRP, land must be suitable for restoration (formerly wetland and drained) or connect to adjacent wetlands. A landowner continues to control access to the land and may lease the land for hunting, fishing, or other undeveloped recreational activities. At

any time, a landowner may request that additional activities be added as compatible uses. Easement participants must have owned the land for at least one year.

9.11 Southeast Rural Community Assistance Project (SE/R-CAP)

The mission of this project is to promote, cultivate, and encourage the development of water and wastewater facilities to serve low-income residents at affordable costs and to support other development activities that will improve the quality of life in rural areas. Staff members of other community organizations complement the SE/R-CAP staff across the region. They can provide (at no cost): on-site technical assistance and consultation, operation and maintenance/management assistance, training, education, facilitation, volunteers, and financial assistance. Financial assistance includes $1,500 toward repair/replacement/ installation of a septic system and $2,000 toward repair/replacement/installation of an alternative waste treatment system. Funding is only available for families making less than 125% of the federal poverty level.

9.12 National Fish and Wildlife Foundation

The National Fish and Wildlife Foundation administers the Chesapeake Bay Stewardship Fund, which is dedicated to the protection and restoration of the Chesapeake Bay. The Stewardship Fund is supported through partnerships with government agencies and private corporations, and typically awards $8 million to $12 million per year through two competitive grant programs and a technical assistance program. Larger "Innovative Nutrient and Sediment Reduction Grants" are available to non profits, local governments and state agencies, while smaller "Small Watershed Grants" are available to non profits and local governments. A request for grant proposals is typically issued in the spring of each year, and awards are made in the late summer/early fall. Additional information on the program may be found at: http://www.nfwf.org/chesapeake/Pages/home.aspx.

9.13 Regional Conservation Partnership Program

The Regional Conservation Partnership Program (RCPP) was authorized through the 2014 Farm Bill. This 5-year program promotes coordination between NRCS and its partners to deliver conservation assistance to producers and landowners. NRCS provides assistance to producers through partnership agreements and through program contracts or easement agreements. The RCPP competitively awards funds to conservation projects

designed by local partners specifically for their region. Eligible partners include agricultural or silvicultural producer associations, farmer cooperatives, state or local governments, municipal water treatment entities, conservation-driven nongovernmental organizations and institutions of higher education. Under RCPP, eligible landowners of agricultural land and non-industrial private forestland may enter into conservation program contracts or easement agreements under the framework of a partnership agreement. The Chesapeake Bay watershed is one of the eight "Critical Conservation Areas" identified for this program. These areas receive 35% of program funding.

9.14 Virginia Natural Resources Commitment Fund

The fund was established in the Virginia Code as a subfund of the Water Quality Improvement Fund in 2008. Monies placed in the fund are to be used solely for the Virginia Agricultural BMP Cost Share Program as well as agricultural needs for targeted TMDL implementation areas.

9.15 Clean Water State Revolving Fund

EPA awards grants to states to capitalize their Clean Water State Revolving Funds (CWSRFs). The states, through the CWSRF, make loans for high-priority water quality activities. As loan recipients make payments back into the fund, money is available for new loans to be issued to other recipients. Eligible projects include point source, nonpoint source and estuary protection projects. Point source projects typically include building wastewater treatment facilities, combined sewer overflow and sanitary sewer overflow correction, urban stormwater control, and water quality aspects of landfill projects. Nonpoint source projects include agricultural, silvicultural, rural, and some urban runoff control; on-site wastewater disposal systems (septic tanks); land conservation and riparian buffers; leaking underground storage tank remediation, etc.

9.16 Wetland and Stream Mitigation Banking

Mitigation banks are sites where aquatic resources such as wetlands, streams and streamside buffers are restored, created, enhanced, or in exceptional circumstances, preserved expressly for the purpose of providing compensatory mitigation in advance of authorized impacts to similar resources. Mitigation banking is a commercial venture that provides compensation for aquatic resources in financially and environmentally

preferable ways. Not every site or property is suitable for mitigation banking. Mitigation banks are required to be protected in perpetuity, to provide financial assurances and long term stewardship. The mitigation banking process is overseen by an Inter-Agency Review Team made up of state and federal agencies and chaired by DEQ and Army Corps of Engineers.

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APPENDICES

APPENDIX A: Community Meeting Minutes

Hardware River Water Quality Improvement Plan
Informational Meeting, Thomas Jefferson SWCD Office
February 4, 2015

PARTICIPANTS

Andy Wilson (Friends of the Hardware River)
Roger Black (Fluvanna County)
Brian Walton (TJSWCD)
Luke Longanecker (TJSWCD)
Claudia Goin (Modesta Farms, Fluvanna Co.)
Tom Pratley (TJSWCD-Fluvanna Co Director)
Alyson Sappington (TJSWCD)
Charles Miller (VDH, Fluvanna County)
Paul Coleman Jr (Albemarle County Farm Bureau)
Elizabeth Chudoba (TJSWCD)
Tara Sieber (DEQ)
John Thomspon (VCE)
George Cushnie (Thistle Gate Vineyard)
Kory Kirkland (NRCS)
Nesha McRae (DEQ)
Wood Hudson (TJPDC)
Josh Kirtley (VDH, Albemarle County)

MEETING SUMMARY

Nesha McRae (DEQ) began the meeting with a review of the TMDL process and a summary of objectives for the meeting. The Lower Hardware River and the North Fork Hardware River were listed for fecal coliform impairments in 2002 and 2006, respectively. *E. coli* TMDLs were completed for the waterways in July 2007. The group reviewed characteristics of the two watersheds, both of which are largely forested. Based on existing land use in the watershed, it is likely that wildlife is significantly contributing to the bacteria load in the streams. This will be challenging with respect to the TMDL process since natural sources of bacteria will not be addressed. The group reviewed the TMDL and de-listing reduction scenarios from the TMDL study for both creeks. Both scenarios include considerable reductions from all land uses in the watersheds, which can be partially attributed to the significant load of bacteria coming from wildlife.

Participants discussed what has happened in the watersheds since the TMDLs were completed in 2007. There have been some notable changes in land use and a number of BMP installations. The TJSWCD received funding from the Nature Conservancy to conduct Coliscan monitoring and install livestock exclusion fencing in the Hardware River watershed a couple of years ago. A considerable amount of fencing has been installed through this grant and through state and federal cost share programs since 2007. Claudia Goin noted that they had recently completed a livestock exclusion project on her family's Century Farm. They were very enthusiastic about the project, which has been of interest to surrounding landowners. The group discussed the different types of fencing systems offered through cost share programs and noted that reduced setback fencing may be of greater interest in the North Fork Hardware River watershed due to the steeper topography and the fact that much of the pasture in the watershed is in the floodplain. Participants noted that it will be important to emphasize the benefits of livestock exclusion from the producer standpoint with respect to ease of handling animals and overall health. It will also be important to promote rotational grazing. There is some general resistance to the government in the area, which may pose some challenges to outreach.

One participant noted that a large amount of pasture was recently converted to corn and soybeans when a cattle operation shut down in the Lower Hardware River watershed (Tapscott's Timber Bought Farm). This operation previously had 600 head of cattle. The land is now leased for corn and soybeans. It is unlikely that it was go back to pasture since all of the cross fencing and boundary fence has been removed. The group thought that this would likely have had some impact on water quality. DEQ staff will take a look at the citizen monitoring data from the SWCD and see if any monitoring points were near this operation.

The group discussed the prevalence of failing septic systems and straight pipes in the watersheds and reviewed how these estimates were developed in the TMDL study. DEQ staff noted that the portion of the bacteria load attributed to straight pipes in the Lower Hardware watershed seemed relatively high (6%). Participants explained that you don't see many homes located right on the stream these days, making them think that the number of straight pipes in the watersheds might be overestimated in the TMDLs. One participant noted that when he has floated the Hardware from Route 6 to the James, he has only seen about two houses along the river. It was also noted that there are some low income homes in the North Fork watershed that have changed hands a few times over the years. It is possible that current owners aren't aware of the existence of a straight pipe on their property. VDH representatives said that they do not come across straight pipes in this area very often, and that the estimate of 6% of the total load in the Lower Hardware seemed too high. The Louisa Fluvanna Housing Foundation might be a good organization to contact regarding financial assistance with septic system repairs and replacements. The organization provide cost share for a previous septic assistance project administered by the TJSWCD in the region. The group discussed the potential need for alternative waste treatment systems based on soil types present in the watersheds and lot sizes. One participant noted that there was not zoning in Fluvanna County before 1972, and that homes built before this time did not have to meet any kind of septic reserve on their lots. It seems that as new homes are constructed, the incidence of alternative waste treatment systems goes up because property owners have trouble meeting all of the requirements for a conventional septic system installation. TJSWCD staff asked whether DEQ would consider funding a septic cost share program wherein systems could be replaced if they did not meet current regulations. While these older systems may not be failing at the moment, it is likely that they will, or that they are still contributing to water quality problems. DEQ staff offered to follow up on this possibility. VDH staff asked whether DEQ has provided funding for discharging systems in the past. This is something that DEQ cannot provide financial assistance with since it involves a permit to discharge pollutants.

The Bundoran Farm just finished a very large livestock exclusion project that includes around three miles of fence. This project along with those completed with the grant funds from the Nature Conservancy should be in the ag BMP tracking program (DEQ staff will retrieve these data).

The group discussed potential targeting strategies in light of the considerable load reductions called for in the TMDL study and wildlife contributions in the watersheds. One strategy would be to target areas where there is considerable recreation on the river. The wildlife management area in the watershed is stocked with trout and is commonly used by local anglers. In addition, people frequently camp and recreate at the confluence with the James River. One participant mentioned that VDOT is working on installing an access area by Route 6, which will likely result in an increase in recreation on the river. Currently it is about a one mile hike in at this

point to get to the river. Some concerns were expressed regarding targeting strategies since there is some uncertainty about how many opportunities there are for BMPs in the watersheds. It was noted that the TJSWCD is currently offering 100% cost share for livestock exclusion practices. It was suggested that the SWCD could conduct targeted outreach in the Hardware River watershed to encourage farmers to participate in this program. District staff explained that staff time is somewhat limited in terms of availability to do door to door outreach, but that the watershed could be included in larger outreach efforts such as meetings and workshops that are sponsored by the SWCD. DEQ staff suggested that the SWCD set up a display at the public meetings for this project and use the meetings as an opportunity to promote the cost share program to watershed landowners.

Participants stated that there is a considerable goose population in the watersheds that could be contributing to the wildlife bacteria load. The Tabscott property was noted as a problem area for geese. The watersheds serve as a major flyway for Canada geese. DEQ staff will follow up on this with DGIF on this and try to get an updated estimate of the goose population. The group could consider some management strategies to control resident geese populations including establishment of grass buffers along ponds and waterways. This can deter geese from staying at one location for too long. One participant noted that bacteria pollution from a resident goose population actually caused a local farmer to exclude their livestock from the stream and install a well for livestock to get water from. In this instance, runoff contaminated with goose feces was polluting the farmer's pond where livestock had previously been getting their water. One participant suggested looking at water quality data in the winter to see if any increases in bacteria can be noted due to resident geese.

The group discussed the bacteria load that has been attributed to pasture in the watersheds. Participants agreed that it is highly unlikely that any pastures in the watersheds are receiving manure applications. Most of the farms in this area are using synthetic fertilizers. It is unlikely that much, if any, manure or poultry litter is being spread. Based on the number of livestock in the watersheds, the pasture load seems to be overestimated in the TMDL study. There are not many horses in the North Fork Hardware watershed any more. After 2008, the number of horses probably went down to around 100 in the watershed. There are very few large horse operations in the watersheds any more, many horse owners sold off their horses around 2008 due to financial pressures. It was noted that northern Fluvanna County most likely has the greatest number of horses.

One participant asked about the incidence of biosolids application in the watershed. DEQ staff offered to follow up on that. Another participant asked about benthic monitoring by DEQ in the watersheds and where stations were located. DEQ staff offered to follow up on that as well.

The group discussed plans for the first public meeting. It was noted that two meetings will be needed in order to get landowners from the North Garden area as well as landowners from the southern portion on the watershed around Scottsville. Several meeting locations were suggested including: Victory Hall in Scottsville, the North Garden Fire Department, the VFW Hall on Route 6 in Scottsville and the Collingswood Community Center in Scottsville (George Goodwin is the person to contact about that facility). The Thistlegate Farm was suggested as another possible location. Thursday evenings are good for meetings, and 6:30 p.m. was identified as a good time. Most of the farmers in the North Fork watershed are retired and work other jobs, so it

would be good to hold the meeting outside of regular working hours. It would be nice to have a local SWCD director do a welcome at the meeting.

Outreach strategies to promote the meetings were discussed. DEQ has prepared a mailing list of riparian landowners in the watershed and is considering doing a mailing announcing the meetings. The group liked the idea of printing fliers, which several participants offered to help distribute. It was also suggested that each organization represented at the informational meeting could help spread the word about the meeting to their contacts. Word of mouth was identified as the best strategy to get people to attend meetings. Local media outlets were identified including Rural VA (a local newspaper), the Scottsville Monthly and the Fluvanna Review, both of which have community calendars. The Rivanna Conservation Society website also has a calendar that events could be posted on. The Channel 29 community calendar was identified as another good way to get the word out.

DEQ staff thanked participants for all of their input and reviewed next steps. DEQ will be sending several participants fliers to distribute to their partners, and a summary of the meeting will be sent out to participants shortly. The meeting was then adjourned.

Hardware River Water Quality Improvement Plan
First Community Meeting: Victory Hall, Scottsville VA
March 31, 2015

PARTICIPANTS

Jack and Ruth Witt	Tom Pratley (TJSWCD)	Judith and Carl Ogborne
Connor Dunwoody	George Cushnie	Carol Owen
Claudia Goin	Eugene Goin	Mary E. Carlile
Roger Black	Jim Bonner	Victoria Smith
Bebe	Lisa DeBritto	Dorothy Bunyon
Brian Walton (TJSWCD)	Luke Longanecker (TJSWCD)	Calvin Johnson
Tara Sieber (VADEQ)	Nesha McRae (VADEQ)	

MEETING SUMMARY

The meeting began with a welcome from Tom Pratley, Thomas Jefferson Soil and Water Conservation District (TJSWCD) Director for Fluvanna County. Mr. Pratley shared information on the work that the TJSWCD has completed in the Hardware River watershed in recent years, primarily in working with local farmers to exclude livestock from the river and its tributaries. Mr. Pratley provided an overview of the TMDL process and explained how the TJSWCD can provide support to landowners interested in implementing best management practices (BMPs). He also introduced two staff members, Luke Longanecker and Brian Walton who were present in order to answer questions about agricultural and residential cost share programs.

Nesha McRae, from the Virginia Department of Environmental Quality (VADEQ) provided an overview of the water quality problems observed in the Hardware River. Monitoring conducted by VADEQ has shown that the river (both the North Fork and the mainstem, also referred to as the Lower Hardware River) are violating the state's water quality standard for *E. coli*, which Nesha explained is a human health concern when people have primary contact with the water. A TMDL study was completed for the Hardware River in 2007. The results of this study were shared with attendees including a "de-listing" reduction scenario and a "0% violation" scenario. Nesha explained that as part of the study, an assessment of all of the sources of E. coli in the watershed was completed, and then reduction scenarios were developed for the different sources outlining what would be needed in order to meet the water quality standard. It was explained that while direct deposition of bacteria into the creeks by wildlife is a significant source in the watershed, it will not be addressed in the water quality improvement plan, which will be designed to address those sources linked to humans (either directly or through land management practices). Nesha outlined the process that will be used to develop the water quality improvement plan and stressed the importance of public involvement. Implementation of the plan will be conducted on a voluntary basis, so local support is very critical to the overall success of this effort.

Several participants in the meeting posed questions about water quality in the Hardware River and its tributaries. A summary of the results of VADEQ's water quality monitoring data was shared with attendees along with a map showing the locations of both VADEQ and volunteer monitoring stations. One participant asked just how bad things were in the watersheds. Nesha explained that the streams were violating the water quality standard somewhere between 20-30% of the time on average, except for out the mouth of the river where violations are much less frequent. One participant asked why then was the segment from the mouth upstream to the next monitoring station shown as impaired on the watershed maps shared in the presentation. It was explained that these designations are based on the assessment unit that a stream segment falls within. The participant responded that this segment really should not be listed as impaired since the drainage area is largely forested and much of the subwatershed is a wildlife management area. Nesha offered to follow up on this issue with the water quality assessor at VADEQ's Valley Regional Office.

The group dismissed for a five minute break after which attendees reconvened in two breakout sessions: an agricultural and a residential working group.

Hardware River Water Quality Improvement Plan
First Community Meeting: North Garden Fire Hall
April 9, 2015

PARTICIPANTS

Lonnie Murray	Liz Palmer	Martin Johnson (TJSWCD)
John Smith	Ann Smith	Don Kain (VADEQ)
May Sligh (VADEQ)	Mary Tillman	Dorothy Tompkins

Brian Walton (TJSWCD)	Emily Nelson (TJSWCD)	Kory Kirkland (NRCS)
Werner Hambsch	Melissa Clark	Nesha McRae (VADEQ)
Steve Clark	Debra Webb	David Webb
Charles Seilheimer	Jeff Gentry	Andy Wilson
Michael Hudson	Jimmy Powell	Cameron Thomas
Peter Dutnell		

MEETING SUMMARY

The meeting began with a welcome from Nesha McRae, from the Virginia Department of Environmental Quality (VADEQ). Nesha provided an overview of the water quality problems observed in the Hardware River. Monitoring conducted by VADEQ has shown that the river (both the North Fork and the mainstem, also referred to as the Lower Hardware River) are violating the state's water quality standard for *E. coli*, which Nesha explained is a human health concern when people have primary contact with the water. A TMDL study was completed for the Hardware River in 2007. The results of this study were shared with attendees including a "de-listing" reduction scenario and a "0% violation" scenario. Nesha explained that as part of the study, an assessment of all of the sources of E. coli in the watershed was completed, and then reduction scenarios were developed for the different sources outlining what would be needed in order to meet the water quality standard. It was explained that while direct deposition of bacteria into the creeks by wildlife is a significant source in the watershed, it will not be addressed in the water quality improvement plan, which will be designed to address those sources linked to humans (either directly or through land management practices). Nesha outlined the process that will be used to develop the water quality improvement plan and stressed the importance of public involvement. Implementation of the plan will be conducted on a voluntary basis, so local support is very critical to the overall success of this effort.

Several participants in the meeting posed questions about water quality in the Hardware River and its tributaries, wanting to know if the best management practices that have been installed in the watershed recently have resulted in water quality improvements. DEQ staff explained that while the data does not show significant improvements in *E. coli* concentrations in the river, this could be a result of where practices are located versus monitoring stations, or a result of weather patterns in recent years. One participant asked if there was a way to distinguish between bacteria coming from wildlife waste, humans or livestock. DEQ staff explained that there are ways of doing this, and that the primary method that the state has used in the past is to look at levels of resistance of bacteria when exposed to different types of antibiotics. However, this is very costly and often times misleading because one sample only represents a snapshot in time, and may also be disproportionately influenced by even a small source near the sampling point. Consequently, DEQ does not use this methodology in the monitoring program much anymore.

A participant asked whether Walnut Creek, a local swimming area, is safe to swim in. DEQ staff explained that swimming advisories are typically issued by the Health Department and recommended that those with concerns about safety check with the local office.

One attendee commented that they were perplexed by the high contributions of bacteria from wildlife in the watershed that were identified in the 2007 study and asked why this was the case. DEQ staff responded that a number of variables are considered when estimating bacteria loading rates from wildlife. It could be a result of the type of habitat available for wildlife in the watersheds, the hydrology of the streams, or other factors including growing deer populations and resident Canada geese. Another participant commented that the large portion of unbuffered streams in the watershed may be a factor as well.

It was suggested that DEQ make water quality data available to the public online. DEQ staff explained that these data used to be available on the DEQ webpage, but that some changes in data platforms had been made that made it challenging to keep the data up on the web. Ultimately the plan is for the agency to get the data back online. In the meantime, the group discussed the possibility of distributing data for the Hardware River to meeting attendees, or possibly posting the data for the Hardware on the DEQ TMDL webpage. Nesha McRae offered to look in to possibilities for this. She also noted that in other watersheds where similar plans have been developed, water quality update meetings have been held in order to share progress with the local community. This is something that could be considered for the Hardware River as well. One participant asked how the water quality standard for *E.coli* was developed. DEQ staff explained that the Environmental Protection Agency provides guidelines to the states, which are charged with developing these standards. The *E.coli* standard is designed to minimize the risk of illness or infection upon having primary contact with the water. Virginia's standard is a two part standard, with an instantaneous criteria of 235 colony forming units (cfu) of *E. coli* per 100 mL of water, and a geometric mean criteria of 126 cfu/100mL.

A participant asked how this local TMDL effort related to the Chesapeake Bay TMDL. DEQ staff explained that the Chesapeake Bay TMDL is designed to address nutrient and sediment pollution, while this effort is targeted at bacteria. However, there are definitely areas of considerable overlap between what needs to be done on the ground to meet Bay TMDL goals versus local goals to restore the Hardware River.

The group dismissed for a five minute break after which attendees reconvened in two breakout sessions: an agricultural and a residential working group.

Hardware River Water Quality Improvement Plan
Agricultural Working Group Meeting: Victory Hall, Scottsville VA
March 31, 2015

PARTICIPANTS

Connor Dunwoody	Tom Pratley (TJSWCD)	Judith and Carl Ogborne
Brian Walton (TJSWCD)	Luke Longanecker (TJSWCD)	Calvin Johnson
Claudia Goin	Victoria Smith	Nesha McRae (VADEQ)

MEETING SUMMARY

Nesha McRae, from the Virginia Department of Environmental Quality (VADEQ) provided an overview of the role of the agricultural working group in the planning process. She explained that the group is typically made up of local farmers, Soil and Water Conservation District and Natural Resources Conservation District staff, along with representatives from other organizations that work in agricultural conservation in the region. The group moved on to discuss the general status of agriculture in the Hardware River watershed today. It was agreed that there has been a general decrease in livestock numbers in the region since the original TMDL study for the river was completed in 2007. One participant noted that there have been some larger groups coming in from the east coast to lease land to grow wheat, soybeans and corn. Much of this land used to be grazed. Several participants expressed concerns about biosolids applications in the watershed. Nesha explained that while there are several permits that have been issued to landowners in the watershed to apply biosolids, this is generally not a concern with respect to *E. coli* concentrations in the stream. This is due to the restrictive requirements regarding treatment and application of biosolids. Nesha asked the group about the ratio of pasture, hayland and fallow pasture in the watershed, explaining that it will be important to know how much pasture is actually grazed in the watershed when identifying suitable BMPs for implementation including livestock exclusion fencing. One participant explained that for his operation, around 75% of pasture/hay is grazed at some point in time, and the remaining 25% is cut for hay. It was noted that much of the cropland in the watershed is leased (e.g. the Timberbought farm) but that most of the pasture with cattle is operated by the owner. Many of the farms in the watershed have farm managers, particularly the larger operations. It was also noted that most of the larger farms have implemented BMPs and have conservation easements in place. Some of the smaller operations are the ones that need the most help.

The group discussed the best ways to get the word out about conservation programs to local farmers and farm managers. The Fluvanna Farm Bureau was noted as a good group to work with on outreach. They have an annual membership meeting, produce two newsletters a year, and hold monthly board meetings. The closest chapter of the Cattleman's Association is in Louisa, but includes Albemarle and Fluvanna Counties as well. They could be a good group to work with on outreach too. Charles Rossan was identified as the best contact there. The group discussed a few different opportunities to conduct outreach at ongoing Farm Bureau events including an annual safety day (held in Orange this year), and field days in August and October. Representatives from the Thomas Jefferson SWCD noted that they have had the best success with outreach events when they partner with Cooperative Extension and the Farm Bureau. Nesha asked whether it might be possible to circulate a survey at one of the regular Fluvanna Farm Bureau meetings to try to collect some more information for this project. She will follow up with Claudia Goin on this possibility. Nesha also said that she would be willing to come and present at the annual meeting or prepare some information for inclusion in one to the newsletters.

In order to gage local interest in different BMP options and identify the most suitable livestock exclusion fencing systems for inclusion in the plan, a survey was distributed to meeting participants. Everyone was asked to rank a series of BMPs along with a series of obstacles to livestock exclusion. The results are summarized in the two tables below:

Table 1. Potential best management practices for consideration. Average rankings are shown below (7 total) with 1 being the highest priority practice and 7 being the very lowest priority.

Best management practice	Description	Rank (1-7)
Streamside livestock exclusion fencing	Excluding livestock from streams with fencing, providing alternative water sources or limited access points to the stream	1
Rotational grazing	Establishing a series of grazing paddocks with cross fencing and rotating livestock to maximize forage production while preventing overgrazing	2
Forested streamside buffers	Planting trees and shrubs in strips (35 foot minimum) along streams adjacent to pasture and cropland	3
Grassed streamside buffers	Planting grasses in strips (35 foot minimum) along streams adjacent to pasture and cropland)	3
Forestation of crop, pasture or hayland	Convert existing pasture, crop or hayland to forest (hardwood or conifers,	5
Continuous no-till	Cropland is planted and maintained using no-till methods, only effective in reducing bacteria for cropland receiving manure applications (not commercial fertilizer)	4
Manure composting/storage facilities (equine)	Construction of planned system designed to manage solid equine waste from areas where horses are concentrated either through composting or storage	4

Table 2. Obstacles to streamside livestock exclusion. Average rankings are shown below (5 total) with 1 being the most common obstacle to address and 5 being the least common obstacle.

Obstacle	Rank (1-5)
The cost of installing fencing and off stream water is too high, even with cost share assistance from federal and state programs	4
Cannot afford to give up the land for a 35 foot buffer	3
General maintenance of fencing is time consuming and expensive	2
Grazing land is rented with short term leases and landowners are not interested in installing and/or maintaining streamside fencing and off stream water	5
People do not trust the government and do not want to work through state and federal cost share programs to installing fencing systems	1

Nesha asked the group about other potential meeting locations in the watershed for the future. She explained that the two groups from the Scottsville and North Garden public meetings would be brought together for one or two more agricultural working group meetings over the next several months. Walton Middle School was suggested as a good location for a meeting. Nesha asked the group about good times/days of the week to might. Participants felt that Tuesdays worked well and asked to meet at 7:00 rather than 6:30 p.m. Nesha thanked everyone for their participation and the meeting adjourned.

Hardware River Water Quality Improvement Plan
Agricultural Working Group Meeting: North Garden Fire Department
April 9, 2015

PARTICIPANTS

Mary Tillman	Dorothy Tompkins	Peter Dutnell
Brian Walton (TJSWCD)	Emily Nelson (TJSWCD)	Kory Kirkland (NRCS)
Werner Hambsch	Melissa Clark	Nesha McRae (VADEQ)
Steve Clark	Debra Webb	David Webb
Charles Seilheimer	Jeff Gentry	Andy Wilson
Michael Hudson	Jimmy Powell	Cameron Thomas

MEETING SUMMARY

Nesha McRae, from the Virginia Department of Environmental Quality (VADEQ) provided an overview of the role of the agricultural working group in the planning process. She explained that the group is typically made up of local farmers, Soil and Water Conservation District and Natural Resources Conservation District staff, along with representatives from other organizations that work in agricultural conservation in the region. The group moved on to discuss the general status of agriculture in the Hardware River watershed today. It was agreed that there has been a general decrease in livestock numbers in the region in recent years. Suburban encroachment was identified as a real problem in the area. It was noted that there is very little cropland in the watershed any more, and that over the past 20 years, the cattle population in the watershed has declined by about 50%. This is largely due to the fact that until last year, cattle have not been economically profitable for many farmers in the region.

One participant noted that you don't see a lot of community investment in the management of natural resources. The majority of landowners in the watershed who are willing to exclude livestock from the stream have already done so. Now we are left with a large number of small farms with property owners who spend large amounts of money maintaining their lawns, but will do little to implement conservation practices. Many landowners cannot afford to set a fence back 35 feet from the stream, while others have concerns about nuisance wildlife and maintenance issues that might come with installing livestock exclusion fencing. Flooding was identified as another deterrent to stream exclusion fencing as you move further downstream in the watershed. Private funds from a foundation have been used to install fencing in the watershed in the past,

but this only went so far. Several participants expressed concern about providing off stream water for livestock when fencing is installed. One landowner shared his experience with the installation of fencing and explained that he ended up tapping in to the well for his house in order to provide water for the cattle. Another participant asked whether he had concerns about depleting the aquifer in using this approach. He explained that he had set his system up with a back up to provide water for his livestock should this become an issue. Another landowner responded that wells are getting more and more expensive to drill as people have to go down further and further (drillers used to go down about 100 feet, now it is more like 200 ft).

One participant noted that there are other conservation practices that landowners can implement besides livestock exclusion. She suggested considering strategies that are more regenerative such as planting warm season grass buffer strips along the stream and implementing rotational grazing. The group discussed the portion of hay/pasture in the watershed that is actually grazed. It was noted that some pasture in the watershed is leased for grazing, but not a very large amount. There is a lot of fallow pasture in the watershed along with quite a few 10-20 acre parcels that are bush hogged or cut for hay in order to keep the land in ag land use for tax purposes. A number of these smaller property owners have removed boundary fencing on their property with the intention of solely using the land for hay. One participant noted that the landowner next to them had recently done this with about 2,000 acres of land. It was stated that there is quite a bit of overstocking in the watershed, particularly on horse farms along with some cattle.

A landowner from the Bundoran Farm mentioned that two phases of fencing were recently completed on the property, and that some water quality monitoring has been done by volunteers to evaluate the improvements in water quality that occur as a result of getting livestock out of the creek. A control station has been established for monitoring along with stations below the BMP sites and significant improvements in water quality have been observed. One landowner estimated that there are somewhere between 100 and 200 cattle on the farm at a given point in time. Another landowner expressed similar concerns about the availability of groundwater in the region as those expressed earlier in the meeting. Water testing was suggested as a good outreach tool in terms of communicating the benefits of conservation practices and getting volunteers from the local community involved.

The group discussed the best ways to get the word out about conservation programs to local farmers. One landowner noted that as a new landowner in the watershed who is interested in implementing different conservation practices, it is very difficult to navigate through different programs and identify the best people to talk to about different practices. He suggested that a centralized location be identified (could be a website or a brochure) where a landowner could identify the appropriate contacts for different types of conservation measures (e.g. conservation easements, forestry, agricultural best management practices). Mailings were identified as a good way to reach local landowners with information. It was also suggested that new landowners could be directed to active farms to see how agricultural best management practices actually work. One participant mentioned that she is currently working on plans for an instructional farm where interested landowners could go to learn more about regenerative agricultural practices such as rotational grazing. Another participant noted that she is a Master Gardener and that they have had great success with distributing brochures in displays that they have set up at local plant nurseries, Southern States and Lowes Garden Center. A brochure could be developed for the

Hardware River watershed that identifies the water quality issues facing the river along with the types of practices that need to be done to correct the problem.

In order to gage local interest in different BMP options and identify the most suitable livestock exclusion fencing systems for inclusion in the plan, a survey was distributed to meeting participants. Everyone was asked to rank a series of BMPs along with a series of obstacles to livestock exclusion. The results are summarized in the two tables below:

Table 1. Potential best management practices for consideration. Average rankings are shown below (7 total) with 1 being the highest priority practice and 7 being the very lowest priority.

Best management practice	Description	Rank (1-7)
Streamside livestock exclusion fencing	Excluding livestock from streams with fencing, providing alternative water sources or limited access points to the stream	2
Rotational grazing	Establishing a series of grazing paddocks with cross fencing and rotating livestock to maximize forage production while preventing overgrazing	1
Forested streamside buffers	Planting trees and shrubs in strips (35 foot minimum) along streams adjacent to pasture and cropland	5
Grassed streamside buffers	Planting grasses in strips (35 foot minimum) along streams adjacent to pasture and cropland)	3
Forestation of crop, pasture or hayland	Convert existing pasture, crop or hayland to forest (hardwood or conifers,	7
Continuous no-till	Cropland is planted and maintained using no-till methods, only effective in reducing bacteria for cropland receiving manure applications (not commercial fertilizer)	4
Manure composting/storage facilities (equine)	Construction of planned system designed to manage solid equine waste from areas where horses are concentrated either through composting or storage	6

Table 2. Obstacles to streamside livestock exclusion. Average rankings are shown below (5 total) with 1 being the most common obstacle to address and 5 being the least common obstacle.

Obstacle	Rank (1-5)
The cost of installing fencing and off stream water is too high, even with cost share assistance from federal and state programs	2
Cannot afford to give up the land for a 35 foot buffer	1
General maintenance of fencing is time consuming and expensive	3

Grazing land is rented with short term leases and landowners are not interested in installing and/or maintaining streamside fencing and off stream water	5
People do not trust the government and do not want to work through state and federal cost share programs to installing fencing systems	4

Nesha asked the group about other potential meeting locations in the watershed for the future. She explained that the two groups from the Scottsville and North Garden public meetings would be brought together for one or two more agricultural working group meetings over the next several months. The group was okay with evening meetings at 6:30 or 7:00. Nesha thanked everyone for their participation and the meeting adjourned.

Hardware River Water Quality Improvement Plan
Agricultural Working Group Meeting Summary: June 11, 2015
Walton Middle School

PARTICIPANTS

Brian Walton (TJSWCD)
Andy Wilson
Nesha McRae (DEQ)
Michael Hudson
Tom Pratley (TJSWCD)
Claudia Goin
Don Kain (DEQ)
George Goin
Cameron Thomas

MEETING SUMMARY

Nesha McRae, VA Department of Environmental Quality (DEQ) began the meeting with several updates to agricultural best management practice (BMP) estimates and land use that were made based on input from the last working group meeting. BMPs installed since 2005 were credited towards implementation goals, and livestock population estimates were reduced by 5% in Albemarle County portions of the watershed and 30% in Fluvanna County portions. In addition, the horse population estimate for the North Fork Hardware was reduced by 40% based on input from the working group. DEQ staff distributed two handouts to the group showing staged BMP scenarios (Stages 1 and 2) and BMP cost estimates and descriptions. The group reviewed each of the BMPs included in the handouts, associated costs and the extent needed. Stage 1 goals included 95% livestock exclusion from streams using different types of exclusion systems with different setback requirements and cost share rates (available through state and federal agricultural BMP cost share programs). Nesha explained that the proportion of the different types of fencing systems was determined based on the survey responses from the group at the last working group meeting. One participant expressed concerns about the willingness of landowners to install exclusion fencing and noted some of the obstacles including maintenance issues and the likelihood of damage to the fence during flooding events. Proper maintenance of streamside buffer areas can also be challenging as these areas become overgrown and attract wildlife. Coyotes have become a real issue in the watershed and riparian buffers can provide them additional habitat. Concerns were also expressed about the availability of electricity to operate a pump for a well, and about watering troughs freezing during the winter.

The group discussed the extent of fencing needed and how many individual landowners this corresponded to. Nesha explained that estimates were developed by looking at aerial imagery of the watershed and the stream network along with the results of a survey completed by the Thomas Jefferson Soil and Water Conservation District where staff floated the entire river and identified properties where livestock still had access. It is estimated that between 35 and 40 landowners would need to install exclusion fencing in order to remove all livestock from the stream. Some participants thought that this number sounded a little low. The group discussed characteristics of these landowners and expressed concerns that they may never "come around." The costs of the various types of livestock exclusion systems were reviewed. One participant noted that if a landowner has a spring on their property that can be developed, this may lower the cost of an exclusion system considerably. Nesha offered to look and see what kind of data is available on the locations of springs in the watershed and see if the landowners still needing to install fencing systems have significant springs on their property.

The group discussed the inclusion of BMPs to address bacteria from horse farms. A small number of equine manure composters were included Stage 1 in the handout. Participants felt that there could be a few farms that would benefit from installation of barnyard runoff controls as well. The group agreed that two in the North Fork and two in the Hardware could probably be sufficient. The group also reviewed BMPs for cropland, which included grass and forested buffers. DEQ staff explained that since very little cropland is receiving manure applications, BMPs to address this bacteria source were limited. One participant expressed a concern about biosolids applications in the watershed. DEQ staff explained that if permit requirements are followed and biosolids are treated as required, it is a very small source of bacteria in the watershed (if any). However, it was also noted that many of the fields receiving biosolids do not have cover crops. Cover crops could be included in the plan to address bacteria sources in the watershed since some cropland is receiving manure applications, and some new acreage may in the future. This would help to address the bacteria impairment while also potentially alleviating some concerns about biosolids runoff into the creek.

The group discussed the extent of pasture management needed in the watersheds in order to address runoff of bacteria from pasture. DEQ staff noted that water control structures and reforestation of erodible pasture BMPs were included in Stage 2 on the handout in order to get the bacteria levels low enough in the river to remove the river from the impaired waters list. Nesha explained that a very small amount of the reforestation practice was included in the plan based on responses to the survey handed out at the last working group meeting. Participants felt that most farmers would not be interested in this practice. However, as a result, a large number of water control structures were needed in order to address the remaining bacteria load. The group agreed that these will be very unpopular in the community and would require unique conditions to really be applicable to many operations. The group discussed ways to reduce the extent of this practice in the plan including increasing the extent of reforestation of erodible pasture. One participant suggested conversion of pasture in fescue to warm season grasses since they typically do a better job of filtering out pollutants. After consulting the VA Agricultural Cost Share Manual, a practice funded through the Department of Game and Inland Fisheries, "Fescue Conversion/Wildlife Option" was identified as one potential tool to assist farmers with this BMP. DEQ staff will follow up on this possibility and try to modify the Stage 2 scenario accordingly.

The group moved on to discuss an appropriate timeline for implementation of the two stages shown in the handout. Some participants felt like it would be good to set a short timeline in order to demonstrate the seriousness of the issue and the need for technical and financial support in order to reduce bacteria in the river to an acceptable level. Another participant expressed a concern that the backlog of 100% cost share fencing projects Soil and Water Conservation Districts are facing might have an impact on the timeline for implementation. DEQ staff explained to the group that the state is currently facing a $37M backlog in funding for 100% cost share fencing practices. Approved contracts for these practices will be honored across the state, but Soil and Water Conservation Districts will most likely face reduced budgets for other BMPs as funds are slowly shifted to address this backlog. Nesha suggested postponing the start date of the implementation timeline, but other participants felt like this might be seen as a sign that landowners were not interested in moving forward with the project. After much discussion, the group agreed to a 5-year timeline for Stage 1 and a 10-year timeline for the total project (5 years for Stage 1, 5 years for Stage 2).

DEQ staff explained next steps for the project including holding a steering committee meeting where participants will review a draft of the implementation plan. Nesha explained that it will be important to have good representation from both of the working groups (agricultural and residential) at the meeting, and asked for volunteers to serve on the committee. An announcement will be sent out to everyone in attendance. Nesha thanked everyone for their participation in the meeting, which was adjourned at 9:00.

Hardware River Water Quality Improvement Plan
Residential Working Group Meeting: Victory Hall, Scottsville VA
March 31, 2015

PARTICIPANTS

Carol Owen	Jim Bonner	Jack Witt
Ruth Witt	George Cushnie	Eugene Goin
Roger Black	Handwriting unclear	Tara Sieber (VADEQ)
Luke Longanecker (TJSWCD)		

MEETING SUMMARY

Tara Sieber, from the Virginia Department of Environmental Quality (VADEQ) provided an overview of the role of the residential working group in the planning process. She explained that the group is typically made up of local residential property owners, local Health Department staff, and representatives from other interested citizens groups in the region. The group moved on to discuss septic system maintenance needs and the degree of awareness in the area regarding what is involved in maintaining these systems. The group agreed that there is a considerable lack of awareness, with many property owners unable to tell you where their tank is actually located.

One participant noted that it does not seem like there are many houses located along the river going from the Route 6 bridge down to the James River. In addition, there are not many livestock along this reach of the river (around 10 miles). It was suggested that far more of the bacteria in the river is coming from the Albemarle County portion of the watershed up towards the headwaters. Another participant commented that the lower Hardware should be broken out into two different portions (Albemarle and Fluvanna) when developing the plan due to the different characteristics of these areas.

Septic tank pumpout programs have been used to raise awareness of maintenance needs in other regions, where some degree of assistance is provided with this regular maintenance through grant programs. The group thought that this might be applicable in the watershed, but was unsure about any sort of targeting strategies such as focusing on homes within a certain distance of the stream or particular subwatersheds. One participant shared their experiences living in the tidal portion of Virginia, where pumpouts were required when any transfer of a property occurred. They thought that this was helpful in encouraging property owners to maintain their systems. It was noted that Fairfax County requires a pumpout with transfers of property as well. Due to the clay soils that are present in much of Fluvanna County, many thought that there would not be much development in the area since these soils typically don't perk. However, alternative waste treatment systems have allowed for development in areas with the soils in the county. It was suggested that a handout with maintenance information on septic systems be developed and made available to local landowners at places like the local library in Palmyra. The county Cooperative Extension Service office would be another good place to leave educational materials.

The group discussed the estimated number of straight pipes in the TMDL study. A representative from the Health Department said that these numbers seemed too high to him and asked if grey water discharges were considered straight pipes in the TMDL. Another participant suggested that localities should work with the Health Department to require that a property owner have a working septic system in order to receive a building permit. This would also be a good way of tracking failing septic systems and straight pipes.

The group discussed the use of alternative waste treatment systems in the watersheds. There are quite a few these days and people don't have a clear understanding of how they work and the maintenance that is involved. The Health Department should have records of these systems. There are required inspections and an operation and maintenance manual that must be followed in cases where these systems are used now.

Tara asked the group about opportunities to connect homes with failing septic systems or straight pipes to public sewer. The group did not think that many opportunities existed. It was noted that there may be some possibilities for connections to sewer along Route 53 heading up from Palmyra, but participants were unsure. One participant asked how schools are treating their waste (are they on public sewer).

The group discussed opportunities for pet waste outreach in the region in order to address bacteria getting in to the creeks when people do not properly dispose of pet waste. The group agreed that there are not many opportunities for an outreach program due to the rural nature of the watershed. Walnut Creek Reservoir was identified as a place where people walk their dogs,

but it is not heavily used for this purpose. One participant noted that there are a number of horse trails in the watershed, and suggested that owners/riders could be encouraged to address trail manure. There are also quite a few stables in the watershed where manure could be an issue with respect to runoff into the creeks.

Luke Longanecker (Thomas Jefferson SWCD) shared a few of his experiences working in the Rockfish River watershed in nearby Nelson County to address failing septic systems and straight pipes. A water quality improvement plan was recently developed by the Department of Environmental Quality for this watershed, and Luke is working with local landowners to implement BMPs in the watershed through a series of inventive based assistance programs. Luke noted that the program has been very successful in the Rockfish and that a number of failing septic systems have been either repaired or replaced. In addition, three straight pipes have been corrected to date.

Tara asked the group if there was a good central location in the watershed for future meetings. Local churches, schools and the rescue squad were suggested. A few schools were noted including Yancey in Esmont, Scottsville Elementary and Walton Middle School. The group felt that Tuesday evenings were the best time to meet. Tara thanked participants and the meeting was adjourned.

Hardware River Water Quality Improvement Plan
Residential Working Group Meeting Summary: June 2, 2015
Walton Middle School

PARTICIPANTS
Brian Walton (TJSWCD)
Andy Wilson
Don Kain (DEQ)
Nesha McRae (DEQ)
Calvin Johnson

MEETING SUMMARY

Nesha McRae (VADEQ) distributed a handout to participants at the start of the meeting showing a summary of septic system repairs and replacements needed in the watershed along with associated cost estimates. The group discussed how these estimates were developed, and more specifically, what could be expected in the watershed in terms of the split between alternative waste treatment systems and conventional septic systems. DEQ staff explained that this split is important since a typical alternative waste treatment system is considerably more expensive than a conventional septic system. The group felt that the estimated proportion of different systems shown in the handout was fairly accurate and did not have any recommended changes. Participants suggested contacting the VA Department of Health to review these figures as well. Nesha agreed she would follow up with them after the meeting.

Participants discussed the cost estimates for the different types of septic systems and repairs to failing systems. One attendee mentioned that he had recently made repairs to two different

septic systems. He performed the repairs using his own equipment and labor, but estimated that if this work had been contracted out, it would have cost around $2,000 in labor and $200 in materials to repair a cracked distribution box and replace clogged drainfield pipes. This matched up well with the estimate shown in the handout of $3,000 for a typical repair. The group noted that the estimate for septic tank pumpouts was probably too low and suggested increasing it to $300-$350. Nesha suggested $325 and the group agreed that would be a good estimate. It was noted that the cost depends on the size of the tank, and can be upwards of $400 for a very large tank.

The group discussed potential locations for pet waste stations in the watershed. Walnut Creek Reservoir may already have one station, but it is a huge park and could probably benefit from one or two more. The group agreed that a pet waste education program or individual pet waste composters would not work well in the watershed due to the typical size of lots. However, installation of residential riparian buffers could be a potential tool to address runoff from residential land. The group reviewed aerial imagery to try to identify locations for residential buffer plantings. A subdivision near Red Hill Road was identified as one potential location along with some homes located between the railroad and Red High School Road along a tributary of the Hardware. There are 8-10 houses along the river with 2-3 acre lots. Andy Wilson offered to look in to opportunities there a bit more. Overall, the group thought that opportunities for residential buffers are somewhat limited though.

The group discussed options for targeting of outreach including areas where septic system failures are most likely. A few potential areas were noted including a small development along Old Lynchburg Road. The group looked at aerial imagery and located the neighborhood on a map. It appeared as though most of it is actually outside of the watershed, but DEQ staff offered to follow up on this in order to verify that. The group agreed that based on experiences that the Thomas Jefferson Soil and Water Conservation District has had with their septic BMP program in Nelson County, it makes sense to cast a wide net rather than concentrating outreach in one portion of the watershed. The Hardware River watershed is not so large that outreach couldn't realistically be conducted to landowners throughout the area.

The group discussed a timeline for implementation. It was agreed that ten years was probably the most realistic timeline for accomplishment of all of the residential septic goals. The group also discussed potential partners in implementation efforts. Septic tank pumpers and contractors who install septic systems were identified as key partners in outreach. DEQ staff noted that they have been instrumental in helping get the word out in other watersheds where funding has been secured to assist homeowners with septic system maintenance. In some project areas, postcards and coupons have been developed and shared with contractors for distribution in order to promote the cost share program available to homeowners. Home inspectors were identified as a good partner, though a concerted effort would need to be made to reach out to them. Often times an inspector will sign off on an inspection without even locating the septic system for a property. If a new homeowner finds a problem with the system after the inspection, it can be detrimental to the inspector's business. A local engineer who designs septic systems was suggested as a good contact for information about system costs. Nesha is going to follow up with this individual. County staff and local Health Department staff were also identified as good partners in septic BMP outreach and implementation.

Nesha thanked participants for attending the meeting and explained that the next step in the process will be to hold a steering committee meeting. At this meeting, participants will provide feedback on the draft implementation plan and offer suggestions on the format and content for the final public meeting. Volunteers from the group to serve on the steering committee will be needed, and Nesha encouraged everyone to participate.

The meeting adjourned at 8:30.

Hardware River Water Quality Improvement Plan
Steering Committee Meeting: November 3, 2015
Scottsville Public Library

PARTICIPANTS
Claudia Goin (Landowner)
Eugene Goin (Landowner)
Carol Owen (Landowner)
Pat Calvert (Upper James Riverkeeper)
Andy Wilson (Landowner)
Tom Pratley (TJSWCD)
Don Kain (DEQ)
Nesha McRae (DEQ)
Brian Walton (TJSWCD)

MEETING SUMMARY

Nesha McRae (VA Department of Environmental Quality) explained that the objectives of the meeting were to review the draft water quality improvement plan for the Hardware River, and to discuss plans for the final public meeting in early 2016. She led the group through a review of the draft water quality improvement plan. The group discussed the general format of the document. It was suggested that the map included in the two page summary (landowners guide) be adjusted so that it was a little more readable. The group discussed notable historic information about the Hardware River and features/landmarks that could be included in the landowners guide. It was noted that there are several mills along the river, and that one had actually been moved to the Boars Head Inn. In addition, it is thought that Patrick Henry's brother is buried along the Hardware River. Pine Knot was identified as an area where Teddy Roosevelt used to hunt, which is located in the watershed. There is an aquaduct that runs over the Hardware River, and the lower section is tied in with a canal along the railroad. Participants suggested contacting the Fluvanna and Albemarle County Historical Departments for additional information. One participant noted that he thought that the Hardware River received its name due to the challenges in navigating it upon initial exploration. It was also stated that the Department of Game and Inland Fisheries stocks trout in the Hardware. Trout Unlimited once published an article about the Hardware River stating that it was the closest thing to a "western river" in the region. One participant suggested developing a map of the watershed with photos taken at various bridges along the river to familiarize people with the watershed (e.g. Route 29,

Route 20 and Route 6). It was also noted that a book has been written about the Hardware River, though it is fiction.

The group reviewed the draft document including the extent of BMP implementation needed. There was some discussion of the original TMDL study and the estimates made regarding the portion of bacteria coming from different sources. Participants noted that the cost of residential BMPs in the plan is very high, but that residential sources of bacteria are a small portion of the overall bacteria load. DEQ staff explained that since the bacteria water quality standard is designed to protect human health, human sources of bacteria are a serious concern since they are more likely to transmit dangerous pathogens. One participant noted that they had once seen a slide in a presentation by DEQ showing the various *E. coli* counts from different sources of bacteria (wildlife, dairy cows, people etc) and suggested that this slide be included in the final presentation for the project. The group discussed how the estimates of failing septic systems and straight pipes were made in the TMDL study for the Hardware River. DEQ staff explained that these estimates are based on the age of homes as identified in the US Census. Average failure rates have been developed for different age classes of homes using data from a study conducted by VA Tech. These estimates are applied to homes in the watershed to come up with failing septic system estimates.

The group reviewed the project partners section of the document. Streamwatch should be taken off of this list since they do not work in the watershed. It was noted that Fluvanna County now has an active group of Master Naturalists who could be a good partner. Other partners that could be added to the list included James River Association and the Chesapeake Conservancy.

The group discussed the Integration with other Watershed Plans chapter of the draft document. Water supply plans and source water protection plans were mentioned as two possible plans that could have some overlap with the water quality improvement plan. In addition, there may be some sort of plan for the Wildlife Management Area down near the mouth of the Hardware. One participant asked about the status of the lower reach of the Hardware River, which is listed as impaired despite the fact that it is violating the water quality standard less than 10.5% of the time. DEQ staff explained that this reach had been grouped into an assessment unit with the upstream portion of the mainstem, which is violating the standard over 10.5% of the time. DEQ staff is working to split this assessment unit so that the lower portion of the river can be included in the de-listing submittal to the Environmental Protection Agency that DEQ will develop with the 2016 water quality assessment. It was noted that the Thomas Jefferson SWCD has a conservation easement program, which could be noted in the chapter is well. One participant stated that the thought that the Seven Islands land will be going into a conservation easement.

The group moved on to discuss plans for the final public meeting. Participants agreed that Walton Middle School would be a good central location in the watershed. Partners will be invited to set up displays at the event. Several partners were identified who might be interested in having a display at the meeting including: Augusta Co-Op, Master Gardeners, the Health Department, SERCAP, the Farm Bureau, local fencing contractors, Bobby Whitescarver, Trout Unlimited, Wild Turkeys Unlimited, VA Cooperative Extension, TJSWCD, VA Department of Forestry and NRCS.

The group discussed potential guest speakers to invite to the meeting. Andy Sorrell was identified as a potential speaker. He works for VA Farm Link and owns the Seven Islands land. Marvin Moss and Steven Meeks were identified as potential speakers who could talk about local history as well.

The group discussed ways to promote the public meeting. They suggested contacting Fluvanna County to get an announcement in their Fluvanna Fan Mail along with the county clerk in Albemarle County. Several radio stations were noted including 105.3 in Dillwyn and WFLO in Farmville. The Rural Virginian, Scottsville Weekly, and Fluvanna Review were noted as local papers (weekly) that might be able to post an announcement. In addition, local community calendars would be worthwhile. The Scottsville Museum also has a weekly email notification they send out. One participant suggested using social media such as Facebook and Twitter to promote the event. DEQ does not have a Facebook or Twitter account, so staff asked for assistance with sending out an announcement through social media channels.

The group discussed refreshments for the meeting. DEQ does not have a budget for food, and will have to rely on donations. Participants suggested contacting the local farm bureaus to ask for support. The Crust and Crumb Bakery in Scottsville was identified as a good local business for refreshments. They are a new business and could probably use to publicity. Albemarle Ciderworks was also noted as a possible partner if they offer a non alcoholic cider. One participant suggested having the company set up a display at the meeting featuring information about their orchards. DEQ staff thought this would be okay provided that the display was not promoting any alcoholic beverages produces at the cidery.

Nesha McRae thanked participants for attending and sharing their input, and explained that the next step will be to schedule the meeting for a weeknight in January. The group thought a Tuesday or Thursday would work best at 7:00 p.m. In the meantime, Nesha will type up a meeting summary and distribute it to participants. The meeting adjourned at 8:30.

APPENDIX B: Public Outreach

First Public Meeting Invitation: Mailing to riparian landowners

March 17, 2015

Dear _____,

I am writing to invite you to a community meeting to kick off the development of a water quality improvement plan for the Hardware River in Albemarle and Fluvanna Counties. The Virginia Department of Environmental Quality will be holding two kick off meetings in the northern and southern ends of the watershed in order to better accommodate local residents. The content shared at both meetings will be the same, though you are welcome to join us for both! Details are listed below:

- Southern meeting: ***March 31, 6:30 p.m. at Victory Hall, 2nd Floor*** (401 Valley St, Scottsville)
- Northern meeting: ***April 9, 6:30 p.m. at North Garden Fire Hall*** (4907 Plank Rd, North Garden)

The water quality plan will be designed to reduce bacteria in the Hardware River and the North Fork Hardware River, which are not meeting Virginia's water quality standard for *E. coli*. This standard is designed to minimize the risk of illness or infection when people are coming into primary contact with the water (swimming, splashing water in eyes or mouth). State law requires that this issue be addressed through a water quality improvement plan (known as a TMDL Implementation Plan). The development of this plan is the next step in a process that began with a study of these creeks in 2007.

Using local input, we will develop a plan that can be implemented voluntarily by stakeholders in the watershed. We hope to draw from experiences that local landowners have had implementing conservation practices and collect ideas on community outreach strategies. As a landowner along the Hardware River, your participation in the development of this plan is critical to ensuring that it includes strategies that the local community can support. During the upcoming meetings, there will be a brief presentation explaining the planning process that we will use, followed by breakout sessions of an agricultural and a residential working group. This will be an excellent opportunity to share your thoughts on the types of actions that should be included in the plan, and the best ways to reach out to landowners. We hope to see you at one of the meetings, please feel free to call with questions in the meantime.

Sincerely,

Nesha McRae, Non Point Source TMDL Coordinator, VADEQ
Phone: (540)574-7850; Email: nesha.mcrae@deq.virginia.gov

Press Release: First Public Meeting

Community Meetings to Discuss a Total Maximum Daily Load Implementation Plan for the Hardware River, Albemarle and Fluvanna County, VA

Two public meetings to discuss a water quality improvement plan for the Hardware River will be held on Tuesday, March 31, 2015 (6:30 – 8:30 p.m. at Victory Hall, 401 Valley St, Scottsville) and Thursday, April 9, 2015 (6:30 to 8:30 pm. at the North Garden Fire Hall, 4907 Plank Rd, North Garden).

The North Fork of the Hardware River and the Hardware River mainstem were identified in Virginia's Water Quality Assessment Integrated Report as impaired for violations of the *E.coli* bacteria water quality standard. This poses a human health risk for people having primary contact with the water (swimming, splashing water into your eyes, ears or mouth). Bacteria sources identified that may contribute to this impairment include failing septic systems, discharges of untreated human waste (straight pipes), wildlife, and agricultural practices in the area.

Representatives from the Virginia Department of Environmental Quality, and other state and local agencies will be on hand to outline efforts to develop a bacteria reduction plan for the impaired waterways. Participation from local residents in this planning process is a critical part of developing the improvement plan.

The water quality or implementation plan follows Total Maximum Daily Load (TMDL) studies completed in 2007 by DEQ. The TMDL studies identified the sources of bacteria in these impaired watersheds.

The implementation plan will outline what is needed to reduce the sources of bacteria in the watersheds, their associated costs and benefits, along with measurable goals and an implementation timeline. Corrective actions (also known as best management practices) may include replacing failing septic systems, removing straight pipes, and reducing polluted runoff from agricultural and residential areas. Best management practices for agricultural sources can include streamside livestock exclusion fencing, rotational grazing, streamside plantings of trees or grasses on cropland and pasture, and reforestation of erodible pasture and cropland.

Participating in developing the implementation plan is an opportunity for local residents and stakeholders to improve and preserve water resources, increase farm production, and increase property values in the community. Strong local public participation ensures a final implementation plan driven by local input. Community involvement in the creation of the plan and support of its implementation are critical factors in determining its success in improving local water quality.

The public comment period for the March 31 meeting will end on April 30, 2015, and the comment period for the April 9 meeting will end on May 11, 2015. For additional information or to submit comments, contact Nesha McRae, at the Virginia Department of Environmental Quality, Valley Regional Office, P.O. Box 3000, Harrisonburg, VA, 22801, by phone (540) 574-7850 or by email nesha.mcrae@deq.virginia.gov.

First Public Meeting Flyer

Community Meeting to develop a clean up plan for

THE HARDWARE RIVER

March 31, 2015
6:30 - 8:30 p.m.

Victory Hall (2nd Floor)
401 Valley Street
Scottsville, VA

Calling all Hardware River Watershed Residents:

The Hardware River watershed includes all of the land area that drains to the river and its tributaries when it rains. Over the next six months, The Virginia Department of Environmental Quality and partners will be working closely with interested watershed residents to develop a clean up plan for the Hardware. Currently, the river is considered unhealthy due to high amounts of fecal bacteria in the water. This means that people face a greater chance of illness or infection when they go swimming in the river or get water in their eyes, ears or mouth. Input from local residents is needed in order to figure out the best ways to address this problem in the watershed. This meeting will serve as the first in a series of opportunities for residents to contribute to the planning process.

If you are interested in learning more about the issues facing the Hardware River and what local landowners can do to help, please join us!

For more information, contact:
Nesha McRae, VADEQ
(540) 574-7850
nesha.mcrae@deq.virginia.gov

DEQ
Virginia Department of Environmental Quality

Community Meeting to develop a clean up plan for

THE HARDWARE RIVER

April 9, 2015
6:30 - 8:30 p.m.

North Garden Fire Hall
4907 Plank Road
North Garden, VA

Calling all Hardware River Watershed Residents:

The Hardware River watershed includes all of the land area that drains to the river and its tributaries when it rains. Over the next six months, The Virginia Department of Environmental Quality and partners will be working closely with interested watershed residents to develop a clean up plan for the Hardware. Currently, the river is considered unhealthy due to high amounts of fecal bacteria in the water. This means that people face a greater chance of illness or infection when they go swimming in the river or get water in their eyes, ears or mouth. Input from local residents is needed in order to figure out the best ways to address this problem in the watershed. This meeting will serve as the first in a series of opportunities for residents to contribute to the planning process.

If you are interested in learning more about the issues facing the Hardware River and what local landowners can do to help, please join us!

For more information, contact:
Nesha McRae, VADEQ
(540) 574-7850
nesha.mcrae@deq.virginia.gov

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Second Public Meeting Invitation: Mailing to riparian landowners

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
VALLEY REGIONAL OFFICE
P.O. Box 3000, Harrisonburg, Virginia 22801
(540) 574-7800 Fax (540) 574-7878
Located at 4411 Early Road, Harrisonburg, VA
www.deq.virginia.gov

Molly Joseph Ward
Secretary of Natural Resources

David K. Paylor
Director

Amy Thatcher Owens
Regional Director

December 21, 2015

«Title» «First_Name» «Last_Name»
«Address»
«City_», «State» «Zip»

Dear «Title» «Last_Name»,
Over the past nine months, The Virginia Department of Environmental Quality and partners have been working with your community to develop a plan to make the Hardware River and its North Fork safe for swimming and recreating. We will present this draft plan at a community meeting on ***January 12 at 7:00 p.m. at Walton Middle School*** (4217 Red Hill Road, Charlottesville VA). Numerous partners will be setting up informational displays at the meeting, so this will be a great chance to learn about the help that is out there for landowners who want to do their part to clean up the river.

The Hardware River and its North Fork are on Virginia's list of "dirty waters" because they violate our water quality standard for bacteria. This means that the chances of someone getting sick after coming into contact with the water (*e.g.* water in the eyes, ears, mouth) are greater than we would like. The high levels of bacteria we are seeing in the water tell us that there is animal and human waste in the river. Failing septic systems, straight pipes, wildlife, and livestock are the main sources. Waste from humans, livestock, pets and wildlife can transmit diseases such as hepatitis A and giardiasis. The plan that we have developed can serve as a road map to correct this problem.

We made many efforts involve the community in creating this plan including agricultural and residential focus group meetings and the formation of a steering committee. The draft plan includes actions that landowners can take to help the river. Examples include replacing failing septic systems, excluding livestock from streams, and implementing rotational grazing systems. The plan also includes a timeline, education and outreach strategies, costs and benefits, and potential funding sources.

The meeting on January 12th will kick off a 30-day public comment period during which anyone can offer feedback on the plan (available after January 12th at http://www.deq.virginia.gov/

Programs/Water/WaterQualityInformationTMDLs/TMDL/TMDLImplementation/TMDLImplementationPlans.aspx).

In the event of inclement weather, the meeting will be postponed until Tuesday, January 19th at the same time and location noted above. If schools are closed on the 12th, then the meeting will be postponed. If inclement weather begins after schools let out for the day, please call the number below to determine whether or not the meeting will be held as scheduled.

As a landowner in the community, your participation in the implementation of this plan is very important. We hope that you will be able to join us to learn more about the river and enjoy some locally made treats!

Sincerely,

Nesha McRae

Nesha McRae
Non Point Source TMDL Coordinator, VADEQ

Phone: (540)574-7850
Email: nesha.mcrae@deq.virginia.gov

Press Release: Second Public Meeting

Community Meetings to Discuss a Total Maximum Daily Load Implementation Plan for the Hardware River, Albemarle and Fluvanna County, VA

A public meeting to present a water quality improvement plan for the Hardware River will be held on Tuesday, January 12, 2016 at 7:00 p.m. at Walton Middle School (4217 Red Hill Road, Charlottesville, VA). In the event of inclement weather, the meeting will be postponed until Tuesday, January 19th, but will still be held at the same time and location. If schools are closed on the 12th, then the meeting will be postponed. If inclement weather begins after schools let out for the day, please call Nesha McRae (540-574-7850) to determine whether or not the meeting will be held as scheduled.

The North Fork of the Hardware River and the Hardware River mainstem were identified in Virginia's Water Quality Assessment Integrated Report as impaired for violations of the *E.coli* bacteria water quality standard. This poses a human health risk for people having primary contact with the water (swimming, splashing water into your eyes, ears or mouth). The high levels of bacteria we are seeing in the water tell us that there is animal and human waste in the river. Failing septic systems, straight pipes, wildlife, and livestock are the main sources. Waste from humans, livestock, pets and wildlife can transmit diseases such as hepatitis A and giardiasis.

Over the past nine months, representatives from the Virginia Department of Environmental Quality have been working with local partners to develop a bacteria reduction plan for the Hardware River. This plan is intended to serve as a road map to correct this problem and make the Hardware River safer for all forms of recreation.

The plan follows a study of the river completed in 2007 by DEQ (formally known as a Total Maximum Daily Load (TMDL)). The study identified the sources of bacteria in the Hardware River and the reductions needed to make the river is safe for swimming and other forms of recreation where people are having primary contact with the water.

The plan that will be presented at the meeting outlines what is needed to reduce the sources of bacteria in the river, their associated costs and benefits, along with measurable goals and an implementation timeline. Corrective actions (also known as best management practices) include replacing failing septic systems, removing straight pipes, and reducing polluted runoff from agricultural and residential areas. Best management practices for agricultural sources can include streamside livestock exclusion fencing, rotational grazing, streamside plantings of trees or grasses on cropland and pasture, and reforestation of erodible pasture and cropland.

Participation in the implementation of this plan from local landowners will be critical to cleaning up the river. The plan will be implemented on a voluntary basis using existing federal and state incentive programs to encourage property owners to implement corrective actions. This meeting will be an excellent opportunity for landowners to learn more about the resources available to help them implement these actions.

During the meeting on January 12th, the draft plan will be presented to the community, and partners will have displays set up with information for landowners on how they can do their part to help clean up the river. In addition, the Albemarle and Fluvanna County Farm Bureaus will be providing refreshments from the Crust and Crumb Bakery in Scottsville. This meeting will kick off a 30-day public comment period extending from January 13, 2016 to February 11, 2016 during which community members can offer suggested changes to the plan. For additional information or to submit comments, contact Nesha McRae, at the Virginia Department of Environmental Quality, Valley Regional Office, P.O. Box 3000, Harrisonburg, VA, 22801, by phone (540) 574-7850 or by email nesha.mcrae@deq.virginia.gov.

Second Public Meeting Flyer

Community Meeting to present a clean up plan for

THE HARDWARE RIVER

January 12, 2016
7:00 - 8:30 p.m.

Walton Middle School
4217 Red Hill Road
Charlottesville, VA

Calling all Hardware River Community Residents:

Currently, the Hardware River is considered unhealthy due to high amounts of fecal bacteria in the water. This means that people face a greater chance of getting sick when they go swimming in the river or get water in their eyes, ears or mouth. Over the past nine months, The Virginia Department of Environmental Quality and partners have been working to develop a clean up plan for the river. Using input from local residents, a plan has been developed outlining what can be done to reduce the amount of fecal bacteria in the water and make the river safe for all kinds of recreation. The succes of the plan relies on voluntary actions from local landowners. At the meeting, participants will hear what they can do to help from local experts.

*Come and enjoy **locally made treats** from the Crust and Crumb Bakery, sponsored by the Albemarle and Fluvanna County Farm Bureaus while you learn what you can do to help the Hardware River!*

In the case of inclement weather, the meeting will be postponed until January 19th at the same time and location. Please call the number below to confirm postponement

For more information, contact:
Nesha McRae, VADEQ
(540) 574-7850
nesha.mcrae@deq.virginia.gov

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

APPENDIX C: Public Comments

Response to Comments Document for Hardware River TMDL Implementation Plan Development

Introduction:

A final public meeting was held for the Hardware River TMDL Implementation Plan on January 12, 2016. This project included the development of a series of implementation scenarios to meet the *E.coli* bacteria TMDLs for the Hardware River and the North Fork Hardware River in addition to incremental water quality milestones. The draft implementation plan was presented at the meeting and made available on the Virginia Department of Environmental Quality (DEQ) website at that time. A 30-day public comment period on the draft plan was held from January 13 until February 11, 2016. During the public comment period, one comment was received from Mr. John Lowry. The full text of the original comments and DEQ's responses to those comments are provided below.

Comments from Mr. John Lowry (Received January 13, 2016)

My land on North Fork of Hardware River is not fenced to exclude cattle. I understand now there should be 35 foot set aside and fencing. My parcel is very small at Route 708 and Route 29 intersection. My neighbor has a typical size parcel and his cattle are not impeded from stream access but only have it a month or two a year. I will speak to him before I fence off. I agree with thinking about those who live "down river" We have a cottage close to the Chesapeake Bay. I think our stream quality is better than it has been and I do not think I will ever see someone swim in the River. We have lived here for more than 25 years. I will pay for fencing cost because it is my land. If average farmer income is minus $12K approx. per year I feel for those guys who need to give up some use of their land. I do not think hiring someone only for the Hardware watershed for the budget estimate is "fair". We (society) have to pay that cost. Maybe if that person covers several programs at the same time the need could be justified. Basically I believe in self compliance through outreach and education. Thank you for your efforts. JL

DEQ Response to Mr. Lowry:

Dear Mr. Lowry,

Thank you for your comments on the Hardware River Water Quality Improvement Plan, and for your commitment to exclude your livestock from the North Fork. Your actions will go a long way in improving water quality in the river. Reaching out to your neighbor about doing the same on their property is a great way to spread the word about the quality of the Hardware River and what local landowners can do to help. As you noted, average farm income levels in Albemarle and Fluvanna Counties are not high, making the cost of fencing and the associated loss of land to a buffer a significant challenge to some farmers. We are fortunate to have a number of state and federal agricultural BMP cost share programs available in the Commonwealth that are designed to help defray some of these costs. We

hope that these programs will serve as useful tools in the Hardware River watershed as we move forward with implementation efforts.

Your comments on the hiring of a staff person to conduct targeted outreach specifically in the Hardware River are appreciated. In other project areas where we have moved forward with implementation of a water quality improvement plan, technical assistance has often been provided by existing Soil and Water Conservation District staff who work within several different programs across a large region. We have been able to utilize federal grant funds to support a portion of their time spent on the particular project area, but typically their time is split between a number of programs as you have suggested.

Thank you again for sharing your comments on this effort, and for your commitment to do your part to improve water quality in the Hardware River.

Sincerely,

Nesha McRae

NPS TMDL Coordinator
Valley Regional Office
VA Department of Environmental Quality